PARENT-IMPLEMENTED FUNCTIONAL COMMUNICATION TRAINING FOR CHILDREN WITH DEVELOPMENTAL DISABILITIES

A Dissertation

by

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ABSTRACT

Children with developmental disabilities (DD) are at an increased risk of engaging in chronic challenging behaviors that can affect both the child and the child's caregivers. Functional communication training (FCT) is a well-researched method for reducing challenging behavior and increasing communication in children with DD. Training parents in FCT may result in additional benefits, such as increased access to intervention and less reliance on professionals. This dissertation contains two studies related to parent-implemented FCT.

The first study is a systematic review and evaluation of the quality of published research in parent-implemented FCT. The systematic review yielded 38 studies related to parent-implemented FCT, many of which were conducted with young children with developmental disabilities. The included studies met many of the field's current single-case research standards, but there is a need for more research with high-quality experimental designs. Strengths of the current literature base and directions for future research are discussed.

The purpose of the second study was to evaluate the efficacy of parent training in improving parents' implementation of FCT. The study included three young children with developmental delays ranging in age from 25 to 33 months old. Two mothers and one father participated as the implementer throughout the study. A multiple-baseline across parent-child dyads design was used to evaluate the impact of parent training on FCT implementation fidelity. Parent training consisted of instructions and performance feedback. Implementation fidelity in the trained routine and in a generalization routine was assessed during the baseline phase and a performance feedback phase. A self-monitoring phase was added if the data indicated the parent did not generalize accurate implementation to the novel routine.

Instructions and performance feedback increased accurate implementation in the training routine for all three parents. One of the parents implemented the intervention accurately in the generalization routine without any additional training. One parent participant required self-monitoring training to implement the intervention accurately in the generalization routine. The third parent-child dyad dropped out of the study before the completion of the generalization assessment. Child challenging behavior decreased and child communication increased following accurate implementation of the intervention.

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CHAPTER I

GENERAL INTRODUCTION

Children with developmental disabilities are approximately three times more likely to engage in challenging behavior than their typically developing peers (Baker et al., 2003; Dekker, Koot, van der Ende, & Verhulst, 2002). Challenging behavior can be defined as any behavior that impedes the child's day-to-day functioning, such as stereotypy, aggression, disruption, and self-injury (Matson & Boisjoli, 2009; Matson & Rivet, 2008). Children who engage in challenging behavior tend to have poorer social interactions, worse academic outcomes, and less access to the community (Murphy et al., 2005; U.S. Department of Education, 2001). Challenging behavior also impacts parent-child relationships, affecting the functioning of the family (Baker et al., 2003). Furthermore, parents of children who engage in challenging behavior report feeling more stressed and less confident in their parenting ability (Baker, Blancher, Crnic, & Edelbrock, 2002; Baker et al., 2003; Bourke-Taylor, Pallant, Law, & Howie, 2012; Woodman & Hauser-Cram, 2013). Without intervention, challenging behavior in children with developmental disabilities tends persist or increase over time (Baker et al., 2003). However, high-quality training in challenging behavior interventions can lead to more positive parent-child interactions and long-term reductions in challenging behavior (Derby et al., 1997; Harding, Wacker, Berg, Lee, & Dolezal, 2009; Mancil, Conroy, & Haydon, 2009; Wacker et al., 2011).

Interventions based on the purpose, or function, of challenging behavior, such as functional communication training (FCT), produce lasting reductions in challenging behavior and improvements in communication (Carr, 1985; Carr & Durand, 1985; Tiger, Hanley, & Bruzek, 2008). Parent implementation of FCT may provide additional benefits such as

increases in parent and child happiness and improvements in family functioning (Koegel, Stiebel, & Koegel, 1998; Sofronoff, Jahnel, & Sanders, 2011). Furthermore, parent implementation builds family capacity to implement the intervention rather than dependence on professionals (Division for Early Childhood of the Council for Exceptional Children, 2014). Parent training can facilitate long-term implementation and access to intervention in situations and settings typically underserved by professionals (Division for Early Childhood of the Council for Exceptional Children, 2014; Matson et al., 2012; Symon, 2001). Although individual studies evaluating parent-implemented FCT have demonstrated its efficacy (e.g., Hanley, Jin ,Vanselow, & Hanratty, 2014; Mancil et al., 2009; Olive, Lang, & Davis, 2008), the feasibility, sustainability, and meaningful impact of training parents to implement FCT has not been assessed.

In order to demonstrate the efficacy of an intervention, high-quality research must show improvements in behavior with typical implementers, such as parents, in typical settings (Horner et al., 2005; Kratochwill et al., 2013; Odom, Cox, & Brock, 2013). Interventions will produce greater reductions in challenging behavior if the parent can implement the intervention across situations and over extended periods of time without formal support, and chooses to do so in the absence of professionals (Horner et al., 2005; Reichow, Volkmar, & Cicchetti, 2008). Parent-implemented FCT will result in the greatest impact and will require few resources from professionals if high-quality research demonstrates parents (a) can implement the intervention, (b) choose to do so in the absence of formal support, and (c) accurately adapt the intervention to novel settings and situations (Horner et al., 2005; Reichow et al., 2008; Schreibman, 1988; Symon, 2005).

To assess the outcomes associated with training parents to implement FCT, the present dissertation included two studies. The purpose of the first study was to synthesize and evaluate the current body of research on parent-implemented FCT. The review included a descriptive synthesis of the literature, an evaluation of the quality of evidence, and an assessment of social validity. Specific research questions included:

(a) What is the quality of the parent-implemented FCT literature as measured by the indicators described in Kratochwill et al. (2013) and Reichow et al. (2008)?

(b) What are the characteristics of parent participants, child participants, and settings included in the parent-implemented FCT literature?

(c) In what ways did parent training promote generalization and maintenance of parent implementation?

(d) To what extent were parents involved in each step of the development and implementation of the intervention (e.g. identification of the function, choosing intervention components, implementing all FCT sessions)?

(e) To what extent do the parent-implemented FCT studies meet the social validity criteria presented in Horner et al. (2005) and Reichow et al. (2008)?

The purpose of the second study was to assess the impact of a parent training strategy on parent implementation of FCT. The study utilized a single-case research design, with three parent-child dyads. Parents were taught to implement functional communication training with their child. The study evaluated parent implementation fidelity in the trained routine and parent generalization to a novel routine. Specific research questions included:

(a) What is the effect of performance feedback on accurate parent implementation of FCT during the trained routine?

(b) What is the effect of performance feedback on accurate parent implementation of FCT during the untrained routine (i.e. generalization routine)?

(c) What is the added benefit of adding self-monitoring to performance feedback?

(d) What is the effect of improvements in implementation fidelity on child challenging behavior and child communication?

CHAPTER II

STUDY ONE

Parent-implemented functional communication training: Systematic review and evaluation of the quality of evidence

Introduction

Effective, feasible, and long-lasting reductions of challenging behavior in natural settings often require parent implementation (Matson et al., 2012; Moes & Frea, 2002; Oono, Honey, & McConachie, 2013). Parent implementation of interventions results in greater improvement, generalization, and maintenance of child outcomes (Koegel, Schreibman, Britten, Burke, & O'Neill, 1982; Matson et al., 2012; Oono et al., 2013; Sanders & Glynn, 1981). Parents often spend the most time with their children and are heavily invested in their children's progress, making them the primary individuals who shape child behavior (Barton & Fettig, 2013; Peterson, Luze, Eshbaugh, Jeon, & Kantz, 2007). However, parents of children with challenging behavior report having less support and more unmet needs as compared to other parents (Bromley, Hare, Davison, & Emerson, 2004). For these reasons, many researchers and practitioners support the use of parent training in research-based interventions to reduce challenging behavior (Estes et al., 2009; Marshall & Mirenda, 2002; Matson et al., 2012; Moes & Frea, 2000; Moes & Frea, 2002; National Research Council, 2001; Walker et al., 2009).

Functional Communication Training (FCT)

FCT is one of the most well studied interventions to decrease challenging behavior, with over 90 articles assessing its efficacy (Falcomata & Wacker, 2013; Tiger et al., 2008; Wong et al., 2014). When implementing a communication intervention to reduce challenging

behavior, it is important to consider the function, or purpose, of the challenging behavior in both the choice of target communication and of reinforcement (Carr & Durand, 1985; Ganz et al., 2012). One such intervention, FCT, involves (a) identifying the function or purpose of the challenging behavior, (b) teaching an alternative communicative response, (c) providing function-based reinforcement for the communicative response, and (d) withholding reinforcement following challenging behavior (Mancil & Boman, 2010; Tiger et al., 2008). Assessments of the efficacy of FCT have aided researchers in developing a highly effective, well-researched method for decreasing challenging behavior (e.g., Buckley & Newchok, 2005; Carr & Durand, 1985; Durand & Carr, 1992; Falcomota, White, Muething, & Fragale, 2012; Ross, 2002). In addition, there is growing support for the use of parent-implemented FCT (e.g., Harding et al., 2009; Mancil et al., 2009; Wacker et al., 2011).

Parent-Implemented FCT

Although previous reviews of FCT suggest its efficacy (e.g., Mancil & Boman, 2010; Tiger et al., 2008; Wong et al., 2014), research related to parent-implemented FCT should be further investigated. There are a number of potential differences in the implementation fidelity and child outcomes associated with parent-implemented interventions. Some children engage in differentially higher rates of challenging behavior during parent-implemented sessions as compared to experimenter-implemented sessions (English & Anderson, 2004; Hanley et al., 2014; Huete & Kurtz, 2010; Ringdahl & Sellers, 2000), which can negatively impact implementation fidelity (McConnachie & Carr, 1997). In addition, parents may be less likely to implement certain intervention components than experimenters or professionals due to differences in training, time constraints, and sources of reinforcement (Feldman, Atkinson, Foti-Gervais, & Condillac, 2004; Moes & Frea, 2000; Moes & Frea, 2002; Sloman

et al., 2005). Due to the unique characteristics associated with parent implementation, there is a need for a focused examination of studies investigating the efficacy of parent-implemented FCT.

Importance of Assessing Research Quality

The purpose of applied behavior analytic research is to identify effective interventions that cause meaningful changes in behavior (Baer, Wolf, & Risley, 1968). Teachers and specialists are required to implement evidence-based practices, to the extent that they are available, when working with children with developmental disabilities (Individuals with Disabilities Education Improvement Act, 2004; Behavior Analyst Certification Board®, 2014). For an intervention to be considered an evidence-based practice, a body of methodologically rigorous studies must demonstrate a causal relationship between the intervention and the dependent variable (Horner et al., 2005; Kratochwill et al., 2013). This type of evidence evaluation involves two components. First, individual studies are assessed based on methodological rigor and demonstration of effect (Horner et al., 2005; Kratochwill et al., 2013). The results of this quality evaluation are then synthesized to determine the strength of the evidence for the intervention (Kratochwill et al., 2013).

With the recent emphasis on the evaluation of research quality, researchers have developed a number of methods to systematically evaluate and synthesize intervention research (e.g., Council for Exceptional Children, 2014; National Autism Center, 2015; Wong et al., 2014). Kratochwill et al. (2013) provided a rubric for evaluating individual studies based on the quality of the experimental design, reliability of the dependent variable, and extent to which a functional relationship was demonstrated. These criteria have been adopted to evaluate the strength of evidence for a variety of different interventions (What Works

Clearinghouse™, 2014). In addition to evaluating the extent to which a given investigation demonstrated experimental control, it is also important to assess the extent to which the study demonstrated the external validity of the intervention (Horner et al., 2005). The Reichow et al. (2008) criteria include a rubric for evaluating research studies based on the social importance of the dependent variable, the description of the participants and procedures, the collection of implementation fidelity data, and the social validity of the intervention. Together, the Reichow et al. (2008) criteria and the Kratochwill et al. (2013) criteria offer a comprehensive and detailed analysis of the quality of the literature with regard to both internal and external validity. For the purposes of the present review, the Kratochwill et al. (2013) criteria were used to evaluate the quality of design, reliability of the dependent variable, and strength of the evidence in parent-implemented FCT. The Reichow et al. (2008) criteria were also employed to evaluate the external validity of the research in parent-implemented FCT.

Importance of Assessing Social Validity

Applied researchers are charged with identifying interventions that are socially valid, or practical, acceptable, and effective in typical settings with typical implementers (Baer et al., 1968; Horner et al., 2005; Schwartz & Baer, 1991; Spear, Strickland-Cohen, Romer & Albin, 2013; Wolf, 1978). The social validity of parent-implemented interventions may be particularly important due to potential resource limitations and priority differences as compared to implementers whose employment depends on interacting with children (e.g., teachers, researchers, clinicians; Feldman et al., 2004; Moes & Frea, 2002; Sloman et al., 2005). Although social validity is one of the pillars of behavior analytic interventions (Baer et al., 1968; Horner et al., 2005), many of the systematic reviews in the areas of FCT and

parent training have not evaluated the social validity of the intervention included in the review (e.g., Oono et al., 2013; Mancil, 2006; Tiger et al., 2008).

Although studies often evaluate social validity solely based consumer reported satisfaction, it is important to consider many components of an intervention in order to fully assess its social validity (Horner et al., 2005; Spear et al., 2013). Consumer report can be affected by a number of extraneous variables, which may or may not relate to the social validity of an intervention (Wolf, 1978). Social validity should be evaluated using multiple criteria in addition to consumer report (Horner et al., 2005; Reichow et al., 2008). Some recent reviews in the areas of functional analysis (Gardner, Spencer, Boelter, Dubard, & Jennett, 2012) and function-based interventions for children with emotional and/or behavioral disorders (Lane, Kalberg, & Shepcaro, 2009) have evaluated social validity using the multi-faceted definition presented in Horner et al. (2005). However, none of the previous reviews in parent-implemented interventions have presented a systematic evaluation of social validity based on a multi-component definition.

Horner et al. (2005) and Reichow et al. (2008) provide multi-component operational definitions of social validity. Studies meeting these criteria provide convincing evidence of the intervention's efficacy in applied settings in the absence of atypical support (e.g., coaching from researchers). The definitions of social validity provided in Horner et al. (2005) and Reichow et al. (2008) include criteria related to (a) the social importance of the dependent variable, (b) the clinical significance of the challenging behavior reduction, (c) implementer report concerning satisfaction, and (d) whether the implementer typically interacts with the child. Criteria unique to the Reichow et al. (2008) indicators include: (a) the efficiency of the intervention, (b) comparison of child behavior to typically developing

peers, and (c) whether the intervention occurred in a natural setting. Horner et al. (2005) provided more detail regarding criteria related to the typical implementer's use of the intervention and the reports from consumers. Because Horner et al. (2005) and Reichow et al. (2008) each contained additional parts to their social validity criteria, the present study used researcher-developed operational definitions adapted from the criteria in Horner et al. (2005) and Reichow et al. (2008) to evaluate the social validity of parent-implemented FCT.

Purpose and Research Questions

Although there have been a number of systematic reviews of FCT (e.g., Falcomata & Wacker, 2013; Hagopian, Boelter, & Jarmolowicz, 2011; Mancil, 2006; Tiger et al., 2008), none of those have synthesized the literature in parent-implemented FCT. Fettig and Barton (2014) evaluated the quality of parent-implemented function-based intervention research. However, their review was restrictive in terms of inclusion criteria (limited age range for child participants) and search procedures ("parent" was used as part of the search terms). Moreover, Fettig and Barton (2014) did not provide a comprehensive assessment of social validity. There is a need for a more comprehensive synthesis of the research regarding parent-implemented FCT that appraises the strength of evidence and incorporates an evaluation of social validity.

The purpose of the present review was to synthesize and evaluate the research on parent-implemented FCT to decrease challenging behavior. The study addressed the following research questions:

(a) What is the quality of the parent-implemented FCT literature as measured by the indicators described in Kratochwill et al. (2013) and Reichow et al. (2008)?

(b) What are the characteristics of parent participants, child participants, and settings included in the parent-implemented FCT literature?

(c) In what ways did parent training promote generalization and maintenance of parent implementation?

(d) To what extent were parents involved in each step of the development and implementation of the intervention (e.g. identification of the function, choosing intervention components, implementing all FCT sessions)?

(e) To what extent do the parent-implemented FCT studies meet the social validity criteria presented in Horner et al. (2005) and Reichow et al. (2008)?

Method

To answer these research questions, the present study employed the following steps: (a) systematic search and identification of articles meeting the inclusion criteria, (b) descriptive synthesis of the studies, (c) evaluation of the strength of the current research base, and (d) an analysis of the social validity of the current intervention procedures.

Systematic Search Procedures

The purpose of the search procedure was to identify articles utilizing parent-implemented FCT to decrease challenging behavior. A research librarian and expert in systematic reviews assisted in the development of the search procedures. Education and psychology databases were searched March 2016, with no restrictions on date, language, or publication type. Synonyms of FCT ("FCT," functional communication training," *or* "functional equivalence training") were used to identify articles in PsycINFO, ERIC (EBSCO), Psychology and Behavioral Sciences Collection, Academic Search Complete, Education Source, and Education Full Text. Based on consultation with the research librarian and the

comprehensive nature of Academic Search Complete, term “FCT” was excluded in the search in Academic Search Complete. After removing duplicates, the terms yielded 416 unique articles.

Following the database search, articles were reviewed based on their titles and abstracts. Articles were kept for further review if the abstract and title indicated that the article utilized FCT as an intervention. The article was not required to describe parents as implementers in the abstract in order to be kept for further review because many articles do not describe the implementer in the title and abstract. Of the 416 articles identified in the database search, 155 articles were excluded based on the title and abstract. The full text of the remaining 261 articles was evaluated based on the following inclusion criteria: (a) the article used FCT as an intervention to decrease challenging behavior (b) the parent implemented one or more intervention sessions in which data were collected on parent and/or child behavior, and (c) the article was in English. In addition, studies employing single-case research designs were required to include a graph of parent and/or child data over time. FCT was defined as: differential reinforcement based on the function of the child’s challenging behavior, provided contingent upon an appropriate communicative response. Parent was defined as: (a) an individual described as the parent or legal guardian or (b) an individual who was primarily responsible for caring for the child (e.g., grandparent), but was not a professional caretaker for the child (e.g. staff at a group home). Following the application of the inclusion criteria, 22 0 articles were excluded. The database search yielded 41 peer-reviewed articles and dissertations.

Additional searches were conducted to identify articles not found through the database search. Articles were identified by reviewing (a) articles included in four previous literature

reviews pertaining to FCT (Durand & Moskowitz, 2015; Heath, Ganz, Parker, Burke, & Ninci, 2015; Mancil, 2006; Tiger et al., 2008), (b) articles published in the two journals with the highest frequency of articles included in the present review, and (c) articles in the reference lists of the peer-reviewed publications identified via the database search. Articles were reviewed and evaluated based on the procedures described above. Following the application of the inclusion criteria, seven additional articles were identified for inclusion, for a total of 48 studies.

Some of the articles included duplicate participants and were not counted as distinct studies. The participants in five of the peer-reviewed articles and five of the dissertations articles were represented in other peer-reviewed articles (i.e. duplicate participants) and those studies were excluded from further review. For dissertations with duplicate participants, the participant information in the dissertation was used to inform the participant description represented for the study. Therefore, there were a total of 38 studies with unique participants.

Data Extraction

Descriptive information. In order to summarize the relevant features of the literature, descriptive information was collected from each study. Child participant information included (a) diagnosis (if applicable), (b) race/ethnicity, (c) age, and (d) gender. Due to the inconsistency in information reported about the parents across studies, all information provided about the parent implementers was recorded. Data collected on methodological characteristics included the (a) setting, (b) procedures for identifying the function of challenging behavior, (c) parent involvement in the procedures, (d) implementation fidelity data reported, and (e) information about generalization and maintenance.

Quality indicators. Researcher-adapted operational definitions based on the Reichow et al. (2008) and Kratochwill et al. (2008) were used to assess the strength of evidence in parent-implemented FCT research (see Appendix A, Tables 1 and 2). Both articles contain quality indicators for single-case research design and group design studies. Because all of the studies in the present review utilized a single-case research design, the raters used the quality indicators pertaining to single-case research.

Each study was evaluated based on the extent to which it met the Kratochwill et al. (2013) single-case research design standards. Studies were characterized as "meets standards," "meets standards with reservations," or "does not meet." In order to meet the reliability criterion, an individual study must collect data to measure reliability during at least 20% of the sessions and obtain at least 80% inter-observer agreement or 0.60 Kappa on average. The studies that do not meet this criterion are characterized as does not meet standards. Studies were also evaluated based on the experimental design. To meet standards, the study must use one of four single-case experimental designs: (a) multiple-baseline design, (b) multiple-probe design, (c) reversal design, or (d) alternating treatment design. Multiple-baseline designs must include staggered implementation of the intervention across three different points in time (for a total of at least six phases). Each phase must include at least three data points per phase (to meet with reservations) or five data points per phase (to meet standards). Multiple-probe designs must meet the multiple-baseline design standards and additional standards, which assess sufficient concurrence across legs (i.e. AB contrasts) of the design (What Works Clearinghouse™, 2014*)*. The additional multiple-probe design criteria are described in Appendix A (Table 1). Reversal/withdrawal designs must include at least four phases and each phase must include at least three data points per phase (to meet

with reservations) or five or more data points per phase (to meet standards). Alternating treatment designs must include at least four data points per condition (to meet with reservations) or five or more data points per condition (to meet standards), with two or fewer data points per phase.

The studies were also evaluated based on the primary and secondary quality indicators described in Reichow et al. (2008). Primary quality indicators were scored on a three-point scale whereas secondary quality indicators were scored on a two-point scale. Four of the standards described in the Reichow et al. (2008) were not included in the present review due to overlap with the Kratowchwill et al. (2013) criteria. The visual analysis, experimental control, inter-observer agreement, and Kappa standards were not included for the purposes of the present review.

Primary quality indicators are necessary to establish validity and include criteria related to the (a) participant description, (b) intervention, (c) dependent variable, and (d) baseline. Secondary quality indicators are important but not imperative to establish validity and include criteria related to: (a) implementation fidelity, (b) blind raters, (c) generalization and/or maintenance, and (d) social validity. Part of the definition of the baseline condition indicator was removed due to overlap with the Kratochwill et al. (2013) criteria. Therefore, the baseline conditions were rated as: described with replicable detail (meets standards), some specific details were missing (meets standards with reservations), or did not meet the criteria (does not meet). A primary quality indicator was added for parent training due to the purpose of the present review and the same definitions described for the baseline criterion were used to rate the description of parent training. A separate analysis was conducted based on the social validity criteria and was reported in the social validity section.

Strength of evidence. The strength of the parent-implemented FCT literature was evaluated based on the criteria presented in Kratochwill et al. (2013). The extent to which the results demonstrated of a functional relationship between FCT and the dependent variable was evaluated for those studies that met standards or met standards with reservations. Studies were categorized as "strong evidence," "moderate evidence," or "no evidence." Studies with strong evidence demonstrated a change in the dependent variable for every manipulation of the independent variable. Studies with moderate evidence maintained a three-to-one ratio of change to no change in the dependent variable for every manipulation of the independent variable. The remaining studies were characterized as no evidence.

Those studies categorized as demonstrating strong or moderate evidence are used to evaluate the extent to which the practice is evidence-based. In order to be considered an evidence-based practice, the review must identify at least five studies with strong or moderate evidence. In addition, the body of studies with strong or moderate evidence must represent 20 unique participants and three distinct research teams. A distinct research team was defined as no overlap in authors (Kratochwill et al., 2013).

Social validity. In order to assess the social validity of the studies, researcher-adapted operational definitions of the social validity criteria presented in Horner et al. (2005) and Reichow et al. (2008) were developed (see Appendix A, Table 3). This social validity quality indicator contained 12 components. Each study was assessed based on whether it met each component and the results were presented as part of the results narrative and in a separate social validity table. Results were synthesized in terms of the percentage of criteria met by each study.

Search Replication and Inter-Rater Reliability (IRR)

Systematic search. A second rater independently conducted the database search. An agreement was counted if both raters included the article or excluded the article. IRR was calculated as the number of agreements divided by the number of agreements plus disagreements times 100. Of the 416 articles identified via the database search, the first and second rater disagreed on the inclusion of five articles (IRR = 99%). The first and second raters discussed disagreements and made a final decision regarding inclusion.

Descriptive table, quality indicators, and social validity. A second rater independently collected data on descriptive information, quality indicators, and social validity for at least 25% of the included studies on each item of each table. For open-ended items, a third rater compared the information from the first and second rater and counted the information as an agreement or a disagreement. The remaining items were counted as an agreement if both raters selected the same response for the item. IRR for each variable was calculated as the number of agreements divided by the number of agreements plus disagreements times 100. Average IRR was 95% for Table 4 (range 83-100%), 87% for Table 5 (range 75-100%), 81% for Table 6 (range 57-100%), 84% for Table 7 (range 67-93%), and 90% for Table 8 (range 80-100%). The first rater discussed all disagreements with the second or third rater to determine the information placed in the table.

Results

Descriptive Synthesis

Participants and setting. Appendix A **(**Table 4) summarizes the participant characteristics and settings. Across the 38 included studies, 93 parents implemented FCT with 84 children. For nine of the child participants, two parents participated as implementers.

The majority of parent implementers were mothers (*n* = 62; 74%), eight were fathers (10%), one was a grandmother, and the remaining implementers were described as "parents" (*n* = 22; 26%). Approximately one third of studies provided additional information about the parent implementer or family (14 studies, 37%). These studies provided information about parent education, age, current employment, and previous training, although the information reported varied by study.

The 84 child participants represented a variety of diagnoses; the most common were ASD (*n* = 34; 40%), developmental delay (*n* = 18; 21%), intellectual disability (*n* = 9; 11%), and cerebral palsy (*n* = 7; 8%). The remaining participants had a genetic syndrome (*n* = 4; 5%), specific delay (*n* = 5; 6%), fetal alcohol syndrome (*n* = 1; 1%), failure to thrive (*n* = 1; 1%), traumatic brain injury (*n* = 1; 1%), oppositional defiant disorder (*n* = 1; 1%), bipolar disorder (*n* = 1; 1%), or no diagnosis (*n* = 2; 2%). Most of the child participants were male (*n* = 63; 75%). Many were younger than 36 months (*n* = 26; 31%) or between the ages of 3 and 5 years (*n* = 45; 54%). The remaining child participants were between 6 and 10 years old (*n* = 7; 8%) or 11 to 21 years old (*n* = 6, 7%). Information regarding race or ethnicity was provided for only ten of the child participants. Eight participants were described as Caucasian and two were described as Hispanic.

Parent-implemented FCT took place in the home setting for almost all child participants (*n* = 81; 96%). Some of those participants received intervention in clinical (*n* = 8; 10%), school (*n* = 12; 14%), and/or community settings (*n* = 3; 4%) in addition to in-home intervention sessions. The study occurred exclusively in a clinical setting for two participants and exclusively in a community setting for another participant.

Parent involvement in FBA and intervention. Appendix A (Table 5) summarizes parent involvement in the FBA and intervention. Nearly every study involved parents in some portion of the FBA process (34 studies; 89%) and parents were often involved in the majority of the FBA and intervention components conducted. FBAs in the included studies consisted of interviews (19 studies), observations (15 studies), and/or functional analyses (31 studies). Parents were included in the interview process for each of the 19 studies that conducted interviews (100%). Of the 15 studies that conducted observations, 14 included parent-child interactions as part of the observation (93%). The parent conducted some or all of the functional analysis in 26 of 31 studies (84%). Parents collected data during the FBA in 5 studies (13%).

As reflected in this study's inclusion criteria, parents implemented at least some of the intervention sessions for all studies. Parents implemented all intervention sessions in 30 studies (79%) and some of the intervention sessions in eight studies (21%). Eight studies included a parent in the development of the intervention (21%). In 11 studies (29%) a parent was asked to implement the intervention outside of (i.e., beyond) the research context. Three studies reported that a parent collected data during the intervention (8%).

Parent treatment fidelity, generalization, and maintenance. Appendix A (Table 6) summarizes the information collected about parent treatment fidelity. Over half of the included studies did not report any data on parent implementation fidelity. Sixteen studies collected and reported data on parent treatment fidelity (42%). Nine of the 16 studies reported the parent implemented the intervention with fidelity, defined as above 80% on average. Three studies collected maintenance data (Derby et al., 1997; Peck et al., 1996; Tait, Sigafoos, Woodyatt, O'Reilly, & Lancioni, 2004) and none of the studies collected

generalization data. Maintenance data were collected 3 to 21 months following the intervention.

Six studies collected data during sessions in which a parent implemented FCT without coaching (38%). Two studies did not provide sufficient information to determine accuracy of parent implementation (Dunlap, Ester, Langhans, & Fox, 2006; Tait et al., 2004). In the remaining four studies, the parents independently implemented the intervention with fidelity (Derby et al., 1997; Mancil et al., 2009; Olive et al., 2008; Suess et al., 2014).

Quality of Evidence

The quality of individual studies in this review was assessed using a combination of evaluation standards from Kratochwill et al. (2013) and Reichow et al. (2008).

Kratochwill et al. (2013) criteria. Appendix A (Table 7) summarizes the number of studies that met the Kratochwill et al. (2013) standards. Of the 38 studies included studies, four met standards (11%), ten met standards with reservations (26%), and 24 did not meet standards (63%). Two of the studies did not meet the Kratochwill et al. (2013) standards due to not reporting a sufficient percentage of sessions with reliability data or due to the reliability data not meeting the minimum threshold (Lucyshyn, Albin, & Nixon, 1997; Moes & Frea 2002). Of the 36 studies that met the reliability standards, 22 studies did not meet the Kratochwill et al. (2013) design standards. Ten studies did not use an acceptable experimental design (Campbell & Lutzker, 1993; Derby et al., 1997; Harding, Wacker, Berg, Barretto, & Ringdahl, 2005; Harding, Wacker, Berg, Winborn-Kemmerer, Lee, & Ibrahimović, 2009; Moes & Frea, 2000; Moore, Gilles, McComaas, & Symons, 2010; Peck et al., 1996; Reeve & Carr, 2000; Richman, Wacker, & Winborn, 2001; Tarbox, Wallace, & Williams, 2003) and seven used experimental designs for different research questions (e.g.

FCT compared to FCT with choice; Brown et al., 2000; Davis, 2008; Harding, Wacker, Berg, Barretto, & Lee, 2005; Harding, Wacker, Berg, Winborn-Kemmerer, & Lee, 2009; Suess et al., 2014; Wacker, Harding, & Berg, 2008; Winborn-Kemmerer et al., 2010). The remaining five studies that failed to meet standards had an insufficient number of phases or too few data points within one or more phases (Arndorfer, Miltenberger, Woster, Rortvedt, & Gaffaney, 1994; Berg, Wacker, Harding, Ganzer, & Barretto, 2007; Carr et al., 1999; Johnson, McComas, Thompson, & Symons, 2004; Rispoli, Camargo, Machalicek, Lang, & Sigafoos, 2014).

Reichow et al. (2008) criteria. Appendix A (Table 7) summarizes the number of studies that met the researcher-adapted primary and secondary indicators proposed by Reichow et al. (2008). Each primary quality indicator was rated on a three-point scale based on whether it met a given standard, met with reservations, or did not meet the standard. Each secondary quality indicator was rated on a two-point scale based on whether it met the standard or did not meet the standard.

Primary indicators included the (a) description of the participants, (b) description of the phases (baseline, parent training, and intervention), and (c) the description and measurement of the dependent variable. All of the studies provided information regarding the child participants' age, gender, diagnosis or eligibility for the study, and behaviors. Therefore, all studies obtained a rating of at least met with reservations on the participant information indicator. Thirty-two studies (84%) obtained a rating of meets standards for participant information because the study also described the individual who trained the parent.

Studies were also evaluated in terms of their description of baseline, parent training, and intervention. Most of the studies described baseline with replicable detail (26 studies; 68%)

or with only a few details missing from the description (8 studies; 21%). The remaining four studies failed to meet this indicator because they did not describe the baseline condition or a baseline condition was not included. Similarly, most of the studies described the intervention either with replicable detail (21 studies; 55%) or with a few specific details missing (15 studies; 39%). Only two studies failed to meet the intervention description criteria (5%). Fewer studies described the parent training with replicable detail (11 studies; 29%) or with a few specific details missing (8 studies; 21%). One half of the studies did not sufficiently describe the parent training (19 studies; 50%).

The description and measurement of the dependent variable is another aspect of quality on which studies were assessed. Most of the studies (26 studies; 68%) were rated as meets on this indicator because they (a) provided an operational definition of the dependent variable, (b) described the data collection with replicable precision, (c) used an appropriate measurement system, and (d) collected data at appropriate times for single-case research. The remaining studies (12 studies; 32%) received a rating of meets with reservations because they did not provide an operational definition of the challenging behavior or the measurement procedure was not described with replicable detail.

Secondary quality indicators included criteria related to blind raters, implementation fidelity, and generalization and maintenance. Five studies met the blind raters indicator (13%) because the raters were blind to the hypotheses or to the condition. As mentioned earlier, 16 studies (42%) collected and reported data on parent implementation fidelity and therefore met the implementation fidelity criteria. Twenty-one studies (55%) collected data on generalization or maintenance of parent or child behavior and therefore met the criteria for generalization and maintenance. Of the 21 studies that met generalization and maintenance

criteria, 13 reported data on generalization of child behavior (34%) and 14 reported data on maintenance of child behavior (37%). Data on parent generalization and maintenance are described above.

Strength of Evidence

The body of parent-implemented FCT research was evaluated to determine the strength of evidence for parent-implemented FCT. Appendix B (Figure 1) describes the number of studies that demonstrated strong or moderate evidence based on the Kratochwill et al. (2013) standards. Fourteen studies met standards or met standards with reservations. Of those studies, nine demonstrated strong evidence of a relation between parent-implemented FCT and reductions in child challenging behavior. None of the studies demonstrated moderate evidence and five studies were deemed to have no evidence. Thus, a total of nine studies employing a single-case research design demonstrated strong or moderate evidence and were used to evaluate the strength of the literature. Those nine studies included 13 participants and came from 6 distinct research teams. In order to be considered an evidence-based practice, the literature base must include at least five single-case research design studies (demonstrating strong or moderate evidence), with at least 20 participants and five distinct research teams. Therefore, the parent-implemented FCT literature base we examined met two of the three criteria for an evidence-based practice.

Social Validity

Appendix A (Table 8) summarizes the studies that met each of the social validity criteria (Horner et al., 2005; Reichow et al., 2008). Included studies met five of the 12 criteria on average (range 3 to 10). All of the studies met the criteria for typical implementer (due to the inclusion criteria of the present review) and social significance of the dependent variable. In

addition, most of the studies met the criteria for typical context (36 studies; 95%) and clinically significant challenging behavior reduction (31 studies; 82%). Eight of the studies compared the behavior of the child to that of typically developing peers (8 studies; 21%). Each of these studies met the criterion because child participants were recruited due to their atypical behavior as compared to typically developing peers (e.g., teacher nomination). Eight studies indicated the parent was able to implement the intervention with fidelity (21%) and two studies indicated parents were able to implement the intervention independently and accurately over time.

Only two studies met the criteria for use of typical resources based on the time and materials required to implement the intervention (5%). Twenty-seven of the studies met the resources criterion based on their materials (71%). The resources criterion also required the study to include a parent trainer who typically interacted with families outside of the research context and who implemented parent training within the typical service delivery model for that provider. Three of the 27 studies that utilized typical resources also included parent trainers who typically interact with families (Dunlap et al., 2006; Hanley et al., 2014; Richman et al., 2001). In Richman et al. (2001) the parent trainer was an individual who typically interacted with families, but the study did not indicate the frequency of sessions. Dunlap et al. (2006) indicated the parent trainer, an early intervention service provider, visited the family one to two times per week. Hanley et al. (2014) indicated the parent trainer, a behavior analyst, visited three to four days per week for 1 hour. Therefore, both of these studies were rated as using typical resources because they utilized a typical interventionist to train the parent within time constraints consistent with the typical service delivery model.

Sixteen studies reported at least one of the four aspects of consumer report. Fourteen studies collected data on parent satisfaction and each of those studies (100%) indicated parents were satisfied with the intervention. Similarly, parents rated the intervention positively in each study that reported feasibility (n = 5) and efficacy (n = 7) information. Parents indicated they would continue to use the intervention in each of the five studies that reported parent ratings on the question. None of the studies reported that parents rated these aspects of the intervention poorly.

Discussion

The purpose of the present study was to synthesize the research in parent-implemented FCT, evaluate the quality of the literature base, and assess the social validity of parent-implemented FCT. Articles were identified via a systematic search of the literature that included a database search, a reference search of included articles, a reference search of relevant literature reviews, and a hand search of two journals. These search efforts yielded 38 articles evaluating the efficacy of parent-implemented FCT. The results of the review indicated mothers and young children with developmental disabilities were often included in the studies. There were a number of high-quality studies that supported the efficacy of parent-implemented FCT, but the compilation of studies did not meet the criteria for an evidence-based practice based on the Kratochwill et al. (2013) standards. Many of the studies were conducted in typical settings with typical materials and parents often indicated the intervention was socially valid.

Descriptive Synthesis

The descriptive synthesis indicated the studies reviewed represented a number of child participants across a variety of disability categories. Many of the studies were conducted with

young children with developmental delays and with mothers as implementers of FCT. Thirty-four of the included studies involved parents in the assessment of challenging behavior in addition to involving the parents in the intervention. In light of previous research indicating children may engage in different patterns of behavior with their parents as compared to professionals (e.g., English & Anderson, 2004; Huete & Kurtz, 2010; Ringdahl & Sellers, 2000), these studies were more likely to have accurately identified the function of behavior relevant to parent-child interactions. Based on these findings, the frequent inclusion of parents in the FBA process is a relative strength of the parent-implemented FCT literature.

The present review also identified limitations in the current literature base and directions for future research. Few of the reported parent participants were fathers and relatively few studies provided information about the parent implementer other than gender, suggesting the need for the inclusion of fathers in research and a more thorough description of parent participants. The present review highlights the need for research evaluating the efficacy of parent-implemented function-based interventions with adolescents as well as with typically developing children. Relatively few studies reported the race, ethnicity, or socioeconomic status of the family. Moreover, few studies were conducted in community settings, even though parents often interact with their children across a variety of settings beyond the home (Carr et al., 1999; Symon, 2001).

In some areas, parent involvement has been limited across this corpus of studies. For instance, while parents were often involved in all aspects of the FBA process and tended to implement every intervention session, they were rarely involved in the development of the intervention. Involving of parents in the development of the FCT intervention plan may lead to increased feasibility and sustainability (Moes & Frea, 2002). Future research should

continue to identify and describe methods to involve parents in the development of the intervention plan. Future research should also continue to evaluate the benefits of including parents in the development of the intervention.

Based on the present findings, there is little evidence for the efficacy of parent training in increasing FCT implementation fidelity. Few studies measured parent implementation fidelity during independently implemented sessions. Only four studies demonstrated that parents were able to implement FCT with fidelity without coaching. The extent to which parent training results in accurate implementation of FCT without coaching, generalization to new situations, and maintenance over time remains unclear. There is a need to develop and evaluate training packages promoting acquisition, generalization, and maintenance of parent implementation.

Quality Analysis

The present study included two measures for evaluating the quality of the parent-implemented FCT literature, based on the work of Kratochwill et al. (2013), Reichow et al. (2008), and Horner et al. (2005). This methodology resulted in a more a comprehensive understanding of the quality of the included studies. The use of both indicators allowed for an analysis of the extent to which the literature base demonstrated the internal and external validity of parent-implemented FCT. The distinct findings from the Kratochwill et al. (2013) criteria and the Reichow et al. (2008) criteria emphasize the importance of evaluating studies based on the procedures, technical description, design, and results.

The current literature base fell slightly short of an evidence-based practice as measured by the Kratochwill et al. (2013) criteria. Many studies did not utilize experimental designs (10 studies) or did not utilize an experimental design to evaluate the efficacy of parent-

implemented FCT (7 studies). Many of the studies with experimental designs did not contain a sufficient number of data points per phase (5 studies). However, most of the studies with sufficiently rigorous designs indicated FCT was effective (9 of 14 studies). These results do not suggest that FCT is likely to result in non-effects or counter-therapeutic effects. Rather, there is a need for more studies with rigorous experimental designs. It is important that future single-case research studies include a sufficient number of data points per phase and utilize an experimental design to evaluate the efficacy of parent-implemented FCT.

Application of the Reichow et al. (2008) criteria suggested additional strengths and limitations of the current literature base. Many of the Reichow et al. (2008) criteria pertain to the description of the methodology, which is important because adequately detailed methodology provides information regarding the circumstances under which the findings are likely to be replicated (i.e. generality of the findings). Many of the studies met the primary quality indicator criteria related to the description of the participants, child dependent variables, baseline procedures, and intervention procedures. Thus, many of the studies provided sufficient detail regarding the circumstances under which FCT is likely to reduce child challenging behavior. However, a large portion of studies failed to describe the procedures used to train parents and did not report data on parent implementation fidelity. Thus, the strategies necessary to produce change in parent behavior remain unclear.

Social Validity Analysis

Social validity criteria were applied to each study to evaluate the extent to which parent-implemented FCT was feasible, acceptable, and meaningfully effective. The social validity analysis indicated typical implementers, parents, could implement the intervention with materials typically found in homes (e.g., toys, books). FCT resulted in meaningful reductions

in challenging behavior, further suggesting the social validity of FCT. In every study that reported parent opinion, parents indicated FCT was acceptable, effective, and feasible. Parents also indicated they would continue to use the intervention.

The social validity analysis also highlighted a few directions for future research. Although parent-implemented FCT did not require any atypical materials, it often required time from specialists who do not typically interact with families outside of a research context. Future research should assess the efficacy and feasibility of typical service providers as parent trainers, with typical service delivery models. Although the social validity data are promising, there is a need for more research indicating the feasibility and sustainability of parent-implemented FCT.

Limitations of the Present Review

A few methodological limitations in the present review should be considered when interpreting the results. The present review synthesized a portion of the literature on parent-implemented challenging behavior interventions; its emphasis on FCT rather than all challenging behavior interventions or all function-based interventions may have distorted the results. Future reviews should conduct a more comprehensive assessment of parent-implemented challenging behavior interventions.

The quality indicator rubric used in the present review was not tested for content validity or inter-rater reliability prior to its application. However, leaders in the field of single-case research developed the indicators that were used for the present review, suggesting the content validity of the indicators. In addition, the inter-rater reliability was above 80% for each table. Future research should assess the reliability and validity of the present measure and the extent to which the measure is relevant to other literature bases.

Conclusions

The present study summarizes a growing body of evidence suggesting that parent-implemented FCT is effective for young children with developmental disabilities. A number of the studies involved young children who would likely qualify for IDEA Part C or Part B services, suggesting the efficacy of parent training in FCT for this population. Service providers who work with children in home, schools, and clinical settings should include parents in the implementation of function-based interventions. This review of the literature supports the importance of training parents of children with developmental disabilities to implement challenging behavior interventions. Although there is a need for more research in the area, the present study indicates training parents in the use of FCT can result in meaningful reductions in challenging behavior.

CHAPTER III

STUDY TWO

Teaching parents to implement functional communication training for young children with developmental disabilities

Introduction

Approximately one in four young children with developmental delay (DD) engage in challenging behavior (Baker et al., 2003; Dekker et al., 2002). Challenging behavior is associated with poor social interactions, more restrictive educational placements, and lower quality of life (Murphy et al., 2005; Murphy, 2009; U.S. Department of Education, 2001). Without intervention, young children with DD will continue to engage in challenging behavior (Baker et al., 2003). However, children who receive interventions based on the function (i.e. purpose) of their challenging behavior often experience long-term reductions in behavior problems (Carr et al., 1999; Derby et al., 1997; Durand & Carr, 1992; Tiger et al., 2008).

In addition to affecting the child's life, challenging behavior negatively impacts the lives of family members. Parents of young children with DD are more likely to report symptoms of stress and depression if their child engages in challenging behavior (Baker et al., 2002; Baker et al., 2003; Bourke-Taylor et al., 2012; Woodman & Hauser-Cram, 2013). Longitudinal research indicates there is a reciprocal interaction between parenting stress and challenging behavior such that each causes an escalation in the other (Baker et al., 2003). In addition, parents of children with challenging behavior report feeling less confident in their parenting ability (Woodman & Hauser-Cram, 2013). There is a need to promote positive

parent-child interactions for young children with DD in order to decrease and prevent challenging behavior.

Functional Communication Training

A large body of evidence supports the efficacy of challenging behavior interventions based on the principles of operant conditioning (Cooper, Heron, & Heward, 2007; Mancil & Boman, 2010; Skinner, 1938/1966; Tiger et al., 2008; Wong et al., 2014). Operant conditioning is the process through which the environmental variables preceding a behavior (i.e. antecedents) and those following a behavior (i.e. consequences) increase or decrease the likelihood of the behavior occurring in the future (Cooper et al., 2007). Reinforcement is the specific process in which behaviors maintain or increase as a result of a consequence, including the removal of a stimulus (i.e. negative reinforcement) or the presentation of a stimulus (i.e. positive reinforcement; Cooper et al., 2007; Carr & Durand, 1985). Children who engage in challenging behavior do so, in part, because of the history of reinforcement related to that behavior (Carr, 1977; Cooper et al., 2007; Skinner, 1938/1966). Challenging behavior serves a purpose, or function, for the child: to remove or access a particular stimulus (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994).

Challenging behavior often serves as a form of communication for the child, to indicate motivation to obtain a stimulus or escape a stimulus (Carr, 1985; Carr, 1988; Carr & Durand, 1985). This relationship between challenging behavior and communication is supported by research that indicates teaching function-based communication can lead to decreases in challenging behavior (Carr & Durand, 1985; Durand & Moskowitz, 2015; Tiger et al., 2008). Interventions are most effective when they (a) are based on the operant function of the

challenging behavior and (b) teach a communicative response to replace the challenging behavior (Carr & Durand, 1985; Dunlap & Fox, 2011).

Functional communication training (FCT) is an intervention in which the individual is taught a socially appropriate communication response to replace challenging behavior (Carr & Durand, 1985). FCT has been shown to lead to decreases in challenging behavior, increases in appropriate child communication, and improvements in parent-child interactions (Olive et al., 2008; Padilla Dalmau et al., 2011; Schindler & Horner, 2005). There is a growing body of empirical support for parent implementation of FCT with young children. To date, 14 studies have evaluated the efficacy of parent-implemented FCT with children younger than 36 months of age (e.g., Harding, Wacker, Berg, Lee, et al., 2009; Wacker, Harding, et al., 2013). For example, Harding, Wacker, Berg, Lee, et al. (2009) taught the mother of a toddler with developmental delays to implement FCT in the home. The child engaged in challenging behavior to escape demands. Results indicated FCT decreased challenging behavior, increased independent communication, and increased task completion.

Parent-Implemented Challenging Behavior Interventions

Parents spend more time with their young children than any other individual and are often the individuals who shape their child's behavior the most (Hart & Risley, 1999; Iovannone, Dunlap, Huber, & Kincaid, 2009). Due to the amount of time parents spend with their children, parents are able to embed teaching trials throughout the day, creating far more learning opportunities for the child than interventions implemented solely by professionals (Barton & Fettig, 2013; Peterson et al., 2007; Symon, 2001). Furthermore, improving parent-child interactions can result in a feasible, intensive (i.e. frequently implemented) intervention for young children (Matson et al., 2012; Symon, 2001).

Parent-implemented interventions provide additional benefit as compared to specialist implementation. Parent-implemented interventions can result in improvements in parent and child happiness and decreases in conflicts between parents (Koegel et al., 1998; Sofronoff et al., 2011). Training parents to promote communication can improve parents' confidence in their parenting ability and can result in increased community participation for the child (Lucyshyn et al., 2007; Stiebel, 1999). There are a number of relative benefits to including parents in the implementation of interventions.

Generalization of Intervention Implementation

Parent-implemented interventions are associated with a number of relative benefits because parents can implement interventions across settings and situations in which professionals do not typically interact with children. However, many of these benefits are predicated on parents' accurate implementation of the intervention in untrained settings and situations. Training packages promoting parent generalization of implementation can cause additional treatment gains for the child (Schreibman, 1988; Symon, 2005). The majority of the research in generalization of parent implementation has evaluated parent use of intervention strategies in novel settings (e.g., Ingersol & Gergans, 2007; Kaiser, Hancock, & Nietfeld, 2000; Koegel, Symon, & Koegel, 2002; Rocha, Schreibman, & Stahmer, 2007; Schertz & Odom, 2007). This research indicates training packages including some or all of the behavioral training strategies (i.e. instructions, modeling, role play, coaching, and performance feedback) result in parent generalization to novel settings (Ingersol & Gergans, 2007; Kaiser et al., 2000; Koegel et al., 2002; Rocha et al., 2007; Schertz & Odom, 2007). However, these studies did not indicate whether parents were able to adapt the intervention to novel situations, or routines.

In early childhood, recommended practice is to embed interventions into naturally occurring routines (Division for Early Childhood of the Council for Exceptional Children, 2014). More specifically, research supports embedding challenging behavior interventions for young children into typically occurring family routines (Duda, Clarke, Fox, & Dunlap, 2008; Dunlap et al., 2006; Dunlap & Fox, 2011; Fettig & Barton, 2014; Moes & Frea, 2000; Moes & Frea, 2002). Embedding interventions into typical routines can promote accurate parent implementation (McLaughlin, Denney, Snyder, & Welsh, 2012). Parents are more likely to continue to implement an intervention in the absence of support from professionals if it fits into their daily activities (McLaughlin et al., 2012; Moes & Frea, 2002). Interventions embedded into typical routines may promote the long-term reduction and prevention of challenging behavior for young children by increasing the feasibility and sustainability of the intervention (McLaughlin et al., 2012; Moes & Frea, 2002). However, it is unlikely that families will have access to training in each routine associated with challenging behavior (Symon, 2001; Wacker, Lee, et al., 2013). It may be useful for the parent to generalize implementation to untrained routines.

To date, five studies have evaluated parents' generalization of implementation of behavior analytic interventions to a novel routine (Hsieh, Wilder, & Abellon, 2011; Kashinath, Woods, & Goldstein, 2006; Lucyshyn et al., 2007; Nunes & Hanline, 2007; Symon, 2005). The interventions in four of these studies did not target challenging behavior reduction (Hsiesh et al., 2011; Kashinath et al., 2006; Nunes & Hanline, 2007; Symon, 2005). In the remaining study, Lucyshyn et al. (2007) demonstrated generalization of child challenging behavior reduction in a fourth routine following parent training in the first three routines. The training package consisted of (a) generalization promotion strategies (self-

monitoring and a problem-solving strategy) and (b) instructions, modeling, coaching, and feedback in three different routines. The parents required training in three routines and the generalization promotion phase prior to the child's challenging behavior decreasing in the fourth routine. Training parents across three routines may not be feasible in applied settings (Symon, 2001; Wacker, Lee, et al., 2013). Training packages resulting in generalization following training in one routine may be more feasible in applied settings. In addition, the study did not present time series data on parent implementation, so it's unclear if the reduction in challenging behavior in the fourth routine was due to generalization of child behavior or generalization of parent behavior. There is a need for more research in efficient methods to promote parents' generalization of accurate implementation to novel routines.

Parent Training

Ample research supports the use of performance feedback, or the provision of praise and corrective feedback following practice sessions, to increase accurate implementation (e.g., Hsiesh et al., 2011; Kaiser et al., 2000; Wacker et al., 2005). There is some research to indicate the necessity of a multi-component training package, including both performance feedback and self-monitoring, to promote generalization (Mouzakitis et al., 2015). Mouzakitis et al. (2015) demonstrated that self-monitoring alone did not result in teacher generalization of accurate implementation to a novel student, but performance feedback and self-monitoring did result in generalization to the novel student (Mouzakitis et al., 2015). Although Mouzakitis et al. (2015) demonstrated the necessity of the performance feedback component, it remains unclear whether self-monitoring is an important component in the training package. Furthermore, there is a need to replicate this type of training research with

parents in the home, as parents may have a different pre-training skill set and may require different strategies to promote accurate implementation and generalization.

Self-monitoring is the act of recording one's own behavior, and is part of the broader category of self-management techniques (Nelson & Hayes, 1981). Self-monitoring may serve to promote generalization by highlighting natural contingencies in the environment (i.e. maintaining consequences), such as the connection between the parent's accurate implementation and improvements in the child's behavior (Rachlin, 1974; Stokes & Osnes, 1989). Self-monitoring may also highlight the relevant stimuli in the environment (i.e. relevant antecedents), which are associated with the desired parent behavior (Albin & Horner, 1988). For example, recording the step "provide the preferred item following communication" may highlight the relevant features of the environment (e.g., the use of communication), which may assist the parent in adapting the intervention to novel routines. Parent training consisting of performance feedback and self-monitoring may be an effective and efficient method to increase accurate implementation and generalization to a novel routine.

Purpose and Research Questions

Previous research indicates parents can implement behavior analytic interventions across novel routines (Hsieh et al., 2011; Kashinath et al., 2006). However, relatively little research has been conducted on parent generalization of challenging behavior interventions. Previous research in parent implementation of challenging behavior interventions during novel routines required training across three routines and assessed generalization in a fourth routine (Lucyshyn et al., 2007). Furthermore there is a need to extend the previous research on the importance of the individual components in the performance feedback and self-monitoring

training package (Mouzakitis et al., 2015). The purpose of the present study is to experimentally evaluate the impact of a parent training on acquisition of FCT implementation and generalization to a novel routine. Research questions include:

(a) What is the effect of performance feedback on accurate parent implementation of FCT during the trained routine?

(b) What is the effect of performance feedback on accurate parent implementation of FCT during the untrained routine (i.e. generalization routine)?

(c) What is the added benefit of adding self-monitoring to performance feedback?

(d) What is the effect of improvements in implementation fidelity on child challenging behavior and child communication?

Method

Participants

Participants were recruited through a local IDEA Part C provider. The first three parent-child dyads that the met inclusion criteria and consented to participate were included in the study. Early intervention service providers referred child participants based on the following criteria: (a) the child was younger than 36 months, (b) the child had a developmental delay, and (c) the child engaged in challenging behavior that was atypical for the child's age and disrupted family routines. The early intervention service provider assessed all child participants using the Battelle Developmental Inventory™, second edition (BDI-2™; Newborg, 2005) prior to the study. The BDI-2™ consists of play-based structured observation and parent interviews to evaluate the child's adaptive, cognitive, communication, personal-social, and motor development. Previous research on the BDI-2™ indicates adequate reliability and validity of the assessment (Bliss, 2007; Elbaum, Gattamorta, &

Penfield, 2010). Each child's mother or father also participated in the study as the implementer of each session. Stephanie Gerow, a doctoral student and Board Certified Behavior Analyst® (BCBA®), served as the behavior consultant.

Michael was a 27-month-old Caucasian boy diagnosed with autism spectrum disorder by a pediatric neurologist. His initial evaluation was conducted when he was 23 months old and he qualified for early intervention services due to delays in personal-social skills (15-month delay), expressive communication (17-month delay), receptive communication (19-month delay), and cognitive ability (11-month delay). Michael's parents reported that he made some single syllable, intentional vocalizations to ask for items, but did not use any full words. For example, Michael would say "ee" for drink, but had not produced the word drink. Michael's parents reported that he frequently engaged in tantrums that included behaviors such as whining and falling to the floor, but did not use any appropriate communication to indicate his needs. Michael's parents indicated they had difficulty figuring out what Michael wanted when he engaged in his tantrums. Michael lived with his mother and father in government supported housing. His mother and father had both completed some community college coursework, were unemployed at the time of the study, and received public assistance for disability. Michael's father was 27 years old and participated as the implementer throughout the study.

Luis was a 25-month-old Hispanic boy, with no formal diagnosis. He was referred to early intervention services by his pediatrician do to an expressive speech delay. He was evaluated for early intervention services at 22 months old. Luis qualified for early intervention services due to his delays in receptive communication (17-month delay) and expressive communication (12-month delay). He also had delays in the domains of adaptive

skills (5-month delay) and cognitive functioning (4-month delay). Direct observations indicated Luis did not follow basic receptive commands (e.g., “put in” or “stack blocks”). His mother reported he engaged in some single-syllable communication and used the sound “ah” to request a variety of items. The interview with his mother and direct observation indicated he did not use any full words at the onset of the study. Luis’s mother reported he often engaged in aggression in the home and at preschool. However, his mother had difficult figuring out what Luis wanted when he engaged in challenging behavior. Luis lived with his mother and his father in a duplex. Luis’s mother and father were both fluent in English and Spanish, but communicated with Luis primarily in English. His mother was 23 years old and participated as the implementer of each of the sessions. His mother had completed high school and was currently working full-time in a pharmacy.

Lucas was a 33-month-old Hispanic and African American boy diagnosed with developmental delay by his pediatrician. He was also diagnosed with a hand deformity due to amniotic band syndrome. He did not have fingers on his right hand, but he was able to hold objects on his right side using his right hand, arm, and body. A plastic prosthetic hand had been donated to his family, but he rarely used the hand in the home. Lucas’s pediatrician referred him to early intervention services due to his developmental delays. He was initially assessed and qualified for services when he was 21 months old. At 33 months old, he was re-assessed using the BDI-2™, which indicated delays in the areas of expressive communication (3-month delay), receptive communication (7-month delay), and gross and fine motor skills (3- and 6-month delay, respectively). Direct observations indicated Lucas understood and followed receptive commands (e.g. “put the toy in the bucket”) and frequently emitted one-word, intentional requests. His mother reported he often engaged in

aggression when he was unable to access a preferred item. In these situations, he typically did not communicate with his mother, so his mother would present him different items and activities until he calmed down. Lucas lived with his mother and his 17-year-old sister, who both spoke English, in a duplex. His mother was a single mother and the family had no contact with his father. Lucas's mother participated with Lucas as the implementer of all of the sessions. She had completed some college coursework and previously served in the military. At the time of the study, she was 43 years old, worked part-time at a local general merchandise big-box store, and received public assistance to support Lucas's daycare fees.

Settings and Materials

All functional behavior assessment, baseline, and intervention sessions were conducted in various locations within the child's home or at a local playground (for Michael only). The setting varied by routine, but remained constant throughout the study. The child, parent, and behavior consultant were present for each session. An additional data collector and other family members were present for some of the sessions. Intervention materials included toys (e.g., puzzles, dolls, blocks) and stimuli used for demands (e.g. toys requiring a simple motor action or items on the floor to pick up), which were present in each child's home prior to the study. Picture cards were also created for Michael and Luis. The picture cards were 2 x 2 in. and contained a picture with the name of the item or activity under it.

Each child's most preferred item was identified using a stimulus preference assessment. The parents identified five toys for use during the preference assessment. A multiple stimulus without replacement preference assessment (MSWO; DeLeon & Iwata, 1996) was used to identify Michael's and Luis's most preferred item. During two MSWO preference assessment sessions, Lucas did not make a second choice after the first item was withdrawn.

For this reason, the behavior consultant chose a free operant preference assessment (Roane, Vollmer, Ringdahl, & Marcus, 1998) to identify Lucas's most preferred item, which did not require Lucas to make a choice or the behavior consultant to remove toys.

Data Collection

The behavior consultant visited each home one to two times per week, with one to four sessions per visit. Each session consisted of four 2-min trials. For the TBFA, data were collected during the control and test portion of the trials. For the treatment evaluation, data were collected during the test portion of each trial.

Dependent measures. Data were collected on parent and child behavior during each session. Accurate parent implementation was measured using a researcher-developed task analysis of FCT. The observer recorded correct or incorrect implementation during each trial on each of the following steps of FCT: (a) following the withdrawal of the activity or item, the parent waited 3 to 5 s, then provided a full verbal or physical prompt if the child did not communicate independently *or* the parent waited for a 3 s break in challenging behavior then provided a full verbal or physical prompt, (b) the parent provided the activity or item (e.g., a break in the escape condition) contingent upon an independent or prompted communication, and (c) the parent ignored challenging behavior. Implementation fidelity was the average percentage of steps implemented correctly across the four trials in each session.

Operational definitions of challenging behavior were developed for each child participant. Michael's challenging behavior was disruptive behaviors, defined as whining (making an "ah sound), jumping on the couch, throwing items, and falling to the floor. Luis's challenging behavior was aggression, defined as hitting, kicking, or throwing toys at people. Lucas's challenging behavior was aggression, defined as hitting, kicking, or pushing a person

or an object. Data were reported on the percentage of trials with challenging behavior during each session.

Data were collected on target and non-target communication throughout the study. Communication was defined as an independent or prompted specific request for an item or activity (e.g. a toy or a break) when access to that item or activity was blocked. Michael and Luis's target communication responses were picture exchange, defined as handing the parent the picture card. Michael's picture cards depicted a puzzle and a playground, with the words "puzzle" and "playground." Luis's picture cards depicted Legos® and a tablet computer, with the words "Legos" and "tablet." Single syllable approximations and manual signs were included in the communication definition for Michael and Luis, although they did not occur during the study. Lucas's target communication was the verbalization "flashlight" and "(name of the current TV show)." Non-targeted one word, specific requests for an item or activity were also counted as communication throughout the study. Data were reported on the percentage of trials with independent or prompted communication during each session.

Inter-observer agreement (IOA) and behavior consultant implementation fidelity. Doctoral students in special education, trained to 80% fidelity with the lead author, collected data on the dependent measures and behavior consultant fidelity. The independent observers collected data for at least 30% of sessions within each phase for each participant. Data were collected using video recordings of the sessions or in-person, depending on participant consent for video recording.

IOA was calculated as the percentage of trials or steps with exact agreement. For challenging behavior and communication, an agreement was counted if both raters record an occurrence or non-occurrence of the behavior. IOA was calculated as the percentage of trials

with agreements divided by the number of trials per session multiplied by 100. For parent implementation fidelity, each observer scored the parent as correct or incorrect on each step of FCT, for each trial. An agreement was scored if both observers counted the step as correct or incorrect. Percentage agreement for each trial was the number of agreements divided by the total number of steps times 100. IOA on implementation fidelity was calculated as the average percentage agreement across the trials in each session. Average IOA was 92% for parent implementation fidelity, 93% for child challenging behavior, and 97% for child communication. Averages for each phase, participant, and rater were higher than 80%. Appendix A (Table 9) depicts IOA averages and ranges by phase and participant.

Data were collected on behavior consultant implementation fidelity based on a researcher-developed task analysis of the steps conducted by the behavior consultant during baseline, performance feedback, and self-monitoring sessions. An independent observer scored the behavior consultant as correct or incorrect on each step in the task analysis. Behavior consultant implementation fidelity was calculated as the number of steps implemented correctly divided by the total number of steps times 100. Behavior consultant implementation fidelity was 99.9% on average (range 97-100%). Appendix A (Table 9) depicts average ratings for behavior consultant implementation fidelity by phase and participant.

Functional Behavior Assessment

Prior to the treatment evaluation, the behavior consultant conducted a functional behavior assessment (FBA). The FBA consisted of a parent interview, direct observation, and a parent-implemented trial-based functional analysis (TBFA).

Interviews. The behavior consultant interviewed the parent using a researcher-adapted version of the Functional Assessment Interview (O'Neill et al., 1997). The Functional Assessment Interview consists of both closed- and open-ended questions and is intended to help the interviewer gain information regarding environmental variables that affect the child's challenging behavior. In the present study, the Functional Assessment Interview was used to develop an operational definition of the challenging behavior, to identify relevant routines associated with challenging behavior, and to identify the child's current level of communication.

Direct observation. The purpose of the direct observation was to identify routines associated with challenging behavior, to further clarify the operational definition of the challenging behavior, and to gather information about the child's current language repertoire. The behavior consultant instructed the parent to interact with the child how he/she typically would during the observations. Each parent-child dyad was observed during three observations, with an average length of 30 min per observation.

TBFA. A TBFA was conducted to assess the relevant antecedents and consequence associated with challenging behavior. TBFAs consist of discrete trials (as opposed to a mass-trial, or traditional functional analysis), allowing the implementer to embed the functional analysis into naturally occurring routines (Rispoli, Ninci, Neely, & Zaini, 2014). The parent implemented the TBFA trials based on the procedures in Rispoli et al. (2015) with coaching from the behavior consultant. The TBFA consisted of thirty 2-min trials, with 10 trials in each of three TBFA conditions: attention, tangible, and demand. Each 2-min trial consisted of a 1-min control component followed by a 1-min test component. Following the TBFA, the percentage of trials with challenging behavior during control components was compared to

the percentage during the test components in order to identify the function of the child's challenging behavior.

The three TBFA conditions were used to identify challenging behavior maintained by social positive reinforcement (tangible and attention conditions) and/or social negative reinforcement (demand condition). During the control component of the attention trials, the parent provided attention at least every 5 s. At the beginning of the test component, the parent indicated he/she needed to do something else (e.g. "I need to make dinner. You can play by yourself.") and moved away from the child. In the control component of the tangible condition, the child had unrestricted access to his/her most preferred item. At the beginning of the test component, the parent withheld the item and indicated the child needed to change activities (e.g., "It's time to play with something different."). During the control component of the demand condition, the parent did not present any task materials or task demands. During the test component, the parent placed a demand (e.g. "put the coin in the toy").

The behavior consultant instructed the parent during the control component of each TBFA trial. After the first minute, the behavior consultant told the parent to arrange the antecedent for the test condition (e.g., remove the preferred item). In order to assess typical parent-child interactions, the behavior consultant did not provide any instruction to the parent about prompting communication or reacting to child behavior. Once the parent arranged the antecedent for the test the condition, the behavior consultant indicated the parent should interact with the child in his/her typical manner or did not instruct the parent at all.

Routine identification. Following the TBFA, the behavior consultant and the parent identified a generalization routine. The routine associated with the most challenging behavior during the TBFA was used as the training routine for the parent and an additional

generalization routine was identified for each parent-child dyad. The following criteria were used for the generalization routine (a) the routine was associated with the same function as the routine in the TBFA condition with the most challenging behavior and (b) the child frequently engaged in challenging behavior during the routine, per parent report. Michael's training routine was playing with a puzzle and his generalization routine was playing on a playground. Luis's training routine was playing with Legos® and his generalization routine was playing with a handheld tablet computer. Lucas's training routine was playing with a flashlight and his generalization routine was watching his preferred television network.

Experimental Design

Following the functional behavior assessment, a multiple-probe across parent-child dyads design (Kennedy, 2005) was used to evaluate the efficacy of parent training. Each leg of the multiple-probe design consisted of a baseline and a performance feedback phase. An additional self-monitoring phase was added if the parent did not meet the pre-determined generalization criterion. In order to assess parent generalization of accurate implementation across routines, data were collected during the training and generalization routines throughout each phase of the study.

Treatment Evaluation

Baseline. Baseline data were collected to assess typical rates of challenging behavior and typical parent reactions to challenging behavior during the training and generalization routines. The baseline procedures were the same as TBFA condition associated with the maintaining function of the child's challenging behavior. For the first minute of each trial, the parent provided access to the item or activity. At the beginning of the second minute, the

parent restricted access to the item or activity and was instructed by the behavior consultant to react to the child in the manner he/she typically would in this situation.

FCT procedures. An individualized intervention was developed for each child based on the function of the child's challenging behavior. The parent implemented FCT during the training routine and generalization routine. The FCT trials followed the same format as the baseline trials, but the FCT sessions included programmed consequences for communication and challenging behavior. Each trial consisted of one minute of free access to an item or activity, followed by the parent restricting access to the item or activity. Following a 3 to 5 s time delay, the parent provided a full verbal model (for Lucas) or physical prompt (for Michael and Luis) for the target communication. If the child engaged in challenging behavior prior to communication, the parent waited for a 3 s break in challenging behavior, then provided a full verbal model or physical prompt for the target communication. The parent was instructed to ignore any other instances of challenging behavior. Contingent upon prompted or independent communication, the parent provided access to the item or activity for the remainder of the trial.

Parent training. The purpose of parent training was to teach parents to independently implement FCT sessions. Parent training was conducted in three phases: (a) an initial meeting with the parent to discuss the intervention, (b) performance feedback, and (c) self-monitoring. Every parent received the initial meeting and the performance feedback phase. The self-monitoring component was added if parent implementation fidelity was below 80% on average during the first three generalization data points and the generalization data indicated no increasing trend in implementation fidelity.

The behavior consultant conducted the initial meeting with the parent. This meeting lasted approximately 30 min for each family. The behavior consultant provided written and verbal information about the TBFA and baseline data. The behavior consultant described the results of the TBFA and explained the purpose of the child's challenging behavior and how the purpose related to the intervention. Next, the behavior consultant provided written and verbal instructions about the intervention. The written instructions were general enough to apply to both the training routine and the generalization routine and the behavior consultant only discussed specific intervention examples regarding the training routine.

Following the initial meeting, the parent was asked to practice implementing FCT during the training routine with his/her child. The behavior consultant indicated the beginning of each trial, the end of the first minute, and the end of the trial. The behavior consultant did not instruct the parent during the trials. Following the trial, the behavior consultant provided immediate performance feedback including: (a) a positive statement about the parent's implementation, (b) praise for each step implemented correctly, (c) information about correct implementation for steps implemented incorrectly and modeling as needed, and (d) an opportunity for the parent to ask questions about implementation. The parent practiced implementing FCT trials with performance feedback until he/she implemented three consecutive trials with 100% implementation fidelity. This training was completed in 16, 13, or 8 two-minute trials with performance feedback for Michael's father, Luis's mother, and Lucas's mother respectively.

Once the parent acquired FCT implementation during the training routine, the parent independently implemented FCT trials during the training and generalization routines. During these sessions, the parent had access to the written intervention instructions and the

behavior consultant indicated the beginning of each trial, the end of the first minute, and the end of each trial. The behavior consultant did not interrupt the session or instruct the parent during the trials. Following each trial, the behavior consultant provided a positive comment (e.g., “it’s looking good.”). At least three generalization data points were collected to assess implementation fidelity in the generalization routine. If the generalization data indicated the parent required additional training based on the pre-determined criteria described above, self-monitoring was added to the training package.

Prior to the first self-monitoring session, the behavior consultant explained the self-monitoring sheet to the parent. The self-monitoring sheet contained the same written instructions that were given to the parent during the initial meeting. Next to each step, there were four columns with blank boxes so the parent could indicate he/she did or did not implement each step correctly across four FCT trials. There was also space at the bottom of the sheet for the parent to indicate whether his/her child engaged in challenging behavior and/or communication during each trial. After the behavior consultant explained the self-monitoring sheet, the parent implemented FCT trials during the training routine and self-recorded the accuracy of his/her implementation after each trial. The behavior consultant and parent discussed disagreements following each trial until the behavior consultant and parent reached 80% agreement on parent implementation across four training routine trials.

Once the parent met the self-monitoring criteria, the parent implemented FCT during the training and generalization routines and self-monitored accuracy of implementation during both routines. The behavior consultant indicated the beginning of the trial, the end of the first minute, and the end of the trial, but did not instruct the parent or interrupt the session in any

way. The behavior consultant prompted the parent to self-monitor following each trial, as necessary.

Social Validity

Social validity questionnaires based on the Treatment Acceptability Rating From-Revised (TARF-R; Reimers & Wacker, 1988) were administered to each parent to evaluate the parent's opinion about the FBA and intervention. The questionnaire contained a series of statements, which the parent rated on a scale of 1 (strongly disagree) to 6 (strongly agree). Questionnaires were administered following the completion of the intervention phase.

Data Analysis

Results were analyzed using visual analysis and a single-case effect size. Visual analysis was conducted based on the criteria described in Kratochwill et al. (2013). An effect size designed for use with single-case research data sets, Tau (Parker, Vannest, & Davis, 2011), was used to evaluate the efficacy of parent training. The Tau was selected because it is nonparametric and therefore does not require the data to fit a particular distribution shape (Parker & Vannest, 2012). Tau is also preferable because individual data points do not have as large of an impact on the calculation as compared to other non-overlap effect sizes (Parker et al., 2011; Parker & Vannest, 2012). Finally, when the baseline data have a trend in the therapeutic direction, Tau can be modified to control for the trend (i.e. TauU; Parker & Vannest, 2012).

The Tau effect size was used to compare data in adjacent phases for each data series. For example, Tau was calculated to compare Lucas's challenging behavior in the baseline phase during the generalization routine to his challenging behavior in the performance feedback phase during the generalization routine. The Tau effect size measures overlap of data points

between baseline and intervention phases. Each baseline data point is compared to every intervention data point and counted as positive (change in therapeutic direction), negative (change in counter-therapeutic direction), or tie (no change). The baseline to intervention improvement is the number of positive pairs minus the number of negative pairs. Tau is calculated as the baseline to intervention improvement divided by the total number of pairs. Tau scores range from -1.00 (all pairs indicate deleterious effect of intervention) to 1.00 (all pairs indicate improvement during intervention).

When baseline data indicate a therapeutic trend, Tau can be altered to account for that trend (Parker & Vannest, 2012). In the present study, each baseline data point was compared to every other baseline data point to assess baseline trend (Parker et al., 2011). Pairs were counted as positive, negative, or tie. If the baseline condition had more positive pairs than negative pairs (i.e. a therapeutic trend), the TauU was calculated rather than Tau. The baseline to intervention improvement is calculated in the same manner as Tau. In TauU, each baseline data point is also compared to every other baseline data point and rated as positive, negative, or a tie. The within baseline improvement is the number of positive baseline pairs minus the number of negative baseline pairs. TauU is calculated as the baseline to intervention improvement minus the within baseline improvement divided by the number of baseline to intervention pairs (Parker & Vannest, 2012).

Results

TBFA

Appendix B (Figure 2) depicts the TBFA data for Michael, Luis, and Lucas. Each child engaged in higher levels of challenging behavior in at least one test condition, indicating each child's challenging behavior was maintained by access to social reinforcement. Michael

engaged in challenging behavior most frequently during the test component of the tangible trials (20% of trials) as compared to the control component of the tangible trials (0% of trials) and the test components of the attention and tangible trials (10% of trials each). Michael's TBFA indicated he engaged in challenging behavior primarily to access tangible items.

Luis engaged in challenging behavior more frequently during the test component of the tangible trials (50% of trials) than the control component of the tangible trials (10% of trials). Luis also engaged in challenging behavior during the test component of the demand trials (30% of trials) and during the test and control components of the attention trials (10% of trials each). Luis's TBFA indicated the primary function of his challenging behavior was to access tangible items and a possible secondary function was to escape demands.

Lucas engaged in challenging behavior more frequently during the test component of the tangible trials (40% of trials) and the test components of the attention trials (30% of trials) as compared to the control components of the demand and attention trials (0% of trials each). Lucas did not engage in any challenging behavior during the test and control components of the demand trials. Lucas's TBFA indicated the primary function of his challenging behavior was to access tangible items and a possible secondary function was to access attention.

Treatment Evaluation

Appendix B (Figures 3, 4, and 5) depicts the parent implementation, challenging behavior, and communication data during the treatment evaluation. For each of the participants, the performance feedback training was associated with improvement in implementation fidelity during the training routine. Performance feedback was associated with improvements in implementation fidelity during the generalization routine for one of the

three participants. In general, improvements in child behavior were associated with increases in parent implementation fidelity.

Performance feedback resulted in increases in implementation fidelity during the training routine for Michael's father. During baseline, Michael's father did not implement the intervention accurately in the training routines (M_{TR} = 0%) and Michael engaged in challenging behavior during the sessions (M_{TR} = 40%, range 0-75%). Following the implementation of performance feedback, implementation fidelity in the training routine improved to 70% (range 0-100%), with the last four data points above 80% fidelity. Michael's challenging behavior decreased to 0% and his communication increased to 100% of trials during the training routine. Michael's family moved unexpectedly during the performance feedback phase, before generalization data collection was complete. Generalization to the novel routine could not be assessed due to the insufficient number of data points.

For Luis's mother, performance feedback resulted in increases in implementation fidelity during the training routine, but not the generalization routine. Self-monitoring resulted in improvements in implementation fidelity during the generalization routine. During baseline, Luis's mother did not implement the intervention accurately in either routine (M_{TR} = 0%; M_{GR} = 0) and Luis engaged in challenging behavior during more than half of the trials (M_{TR} = 65%, range 50-100%; M_{GR} = 75%, range 50-100%). Following the onset of performance feedback, Luis's mother's implementation fidelity improved (M_{TR} = 69%, range 33-100%), with the last three training routine data points above 80% implementation fidelity. Luis's mother's implementation fidelity was below 80% on average during the first three generalization data points and the data were relatively stable (M_{GR} = 63%, range 50-80%).

Due to these generalization data, Luis's mother met the criteria for implementing the self-monitoring phase. Luis's challenging behavior improved in the training routine (M_{TR} = 29%, range 0-75%), but did not improve in the generalization routine (M_{GR} = 67%, range 50-100%). During the self-monitoring phase, Luis's mother's implementation fidelity remained high during the training routine (M_{TR} = 94%, range 75-100%) and implementation fidelity during the generalization routine improved (M_{GR} = 91%, range 78-100%). Luis's challenging behavior during the generalization routine decreased (M_{GR} = 31%, range 0-75%) and his communication remained high (M_{GR} = 94%, range 50-100%).

Performance feedback resulted in improvements in implementation fidelity in the training and generalization routine for Lucas's mother. Lucas's mother did not implement the intervention during baseline (M_{TR} = 2%, range 0-11%; M_{GR} = 3%, range 0-10%). During baseline, Lucas engaged in challenging behavior (M_{TR} = 63%, range 0-100%; M_{GR} = 83%, range 75-100%) and communication infrequently (M_{TR} = 4%, range 0-25%; M_{GR} = 25%, range 0-75%) during baseline. In the performance feedback phase, Lucas's mother's implementation fidelity improved in the training and generalization routines (M_{TR} = 81%, range 33-100%; M_{GR} = 91%, range 67-100%). Lucas's challenging behavior decreased in both routines (M_{TR} = 18%, range 0-25%; M_{GR} = 5%, range 0-25%) and his communication increased (M_{TR} = 89%, range 75-100%; M_{GR} = 95%, range 75-100%).

Effect Sizes: Tau

Appendix A (Table 10) displays the effect sizes for each comparison conducted. The effect sizes assessed improvement in the training and generalization routine from (a) baseline to performance feedback and (b) performance feedback to self-monitoring. The training routine implementation fidelity effect size was 0.86, 1.00, and 1.00 for Michael's father,

Luis's mother, and Lucas's mother. The generalization routine implementation fidelity effect size was 1.00 for Luis's mother and Lucas's mother. The training routine challenging behavior effect size was 0.80, 0.67, and 0.60 for Michael, Luis, and Lucas. The generalization routine challenging behavior effect size was 0.11 and 0.87 for Luis and Lucas. The training routine communication effect size was 1.00 for Michael, Luis, and Lucas. The generalization routine communication effect size was 1.00 for Luis and 0.93 for Lucas.

A second set of effect sizes was calculated for Luis to compare the performance feedback to the self-monitoring phase. The training routine effect sizes did not indicate a large difference in implementation fidelity (TauU = 0.31), challenging behavior (TauU = -0.02), or communication (TauU = 0.28) because Luis's mother implemented the intervention accurately in the training routine in both phases. The generalization routine effect sizes indicate Luis's mother's implementation fidelity improved from the performance feedback to the self-monitoring phase (Tau = 0.82). Luis's communication improved from the performance feedback to the self-monitoring phase (TauU = 0.49). However, the effect sizes didn't suggest large improvements Luis's challenging behavior (Tau = 0.69) due to overlap between phases.

Social Validity

The social validity questionnaire consisted of 24 items rated on a six-point scale from 1 (strongly disagree) to 6 (strongly agree). The social validity questionnaire was administered to Luis's mother and Lucas's mother, but not to Michael's father due to the early termination of the study. Average social validity ratings for the functional behavior assessment was 6 for Luis's mother and 6 for Lucas's mother. Average social validity ratings for the intervention was 5.94 for Luis's mother and 5.75 for Lucas's mother. Both of the mothers selected

“strongly agree” to indicate the intervention was effective and acceptable. The mothers also considered the intervention feasible given their current resources (both parents selected “strongly agree”). Finally, each of the mothers selected “strongly agree” to indicate they would continue to implement the intervention.

Discussion

The purpose of the present study was to evaluate the impact of parent training on implementation fidelity in a trained and in an untrained routine. A secondary purpose was to evaluate the importance of adding self-monitoring to performance feedback in order to promote generalization. The data indicated performance feedback resulted in acquisition of accurate implementation fidelity in the training routine for all three participants. In addition, performance feedback resulted in generalization of accurate implementation fidelity for one of the participants. For another participant, self-monitoring in addition to the performance feedback training package resulted in generalization. Generalization was not fully assessed for the third participant due to an unexpected move. Improvements in child behavior were associated with accurate parent implementation during most of the sessions.

For one of the participants, written and verbal instructions with performance feedback was associated with acquisition and generalization of accurate implementation fidelity. For this participant, common stimuli across the two routines may have served as discriminative stimuli for accurate implementation (Albin & Horner, 1988; Stokes & Osnes, 1989). For example, the written instructions, the child, or the behavior consultant may have been a discriminative stimulus for accurate implementation, given the history of reinforcement under these conditions. In addition, praise during the performance feedback sessions or

changes in child behavior may have served as reinforcement for accurate implementation in the presence of the common stimuli.

For Luis's mother, self-monitoring in addition to performance feedback resulted in generalization of accurate implementation to the second routine. Self-monitoring may have promoted generalization by functioning as a discriminative stimulus for accurate implementation or by highlighting the natural contingencies in the environment (Albin & Horner, 1988; Stokes & Osnes, 1989). During the performance feedback phase, the common stimuli across the two routines may not have been sufficient to promote stimulus control of accurate implementation. The self-monitoring sheet may have been a more salient discriminative stimulus for Luis's mother than the other stimuli that were common across the two routines. However, written instructions were available to the parent during the performance feedback phase. The written instructions and self-monitoring sheet were very similar and the remaining stimuli were the same across phases. It is unlikely that the self-monitoring sheet served as a more salient discriminative stimulus than the written instructions. Alternatively, the performance feedback training may not have sufficiently highlighted the relation between accurate implementation and changes in child behavior to promote generalization. Self-monitoring may have highlighted the relation between the parent's behavior and improvements in the child's behavior during the generalization routine, thereby providing reinforcement for accurate implementation (Albin & Horner, 1988; Stokes & Osnes, 1989).

Caution should be taken when interpreting the results of this study due to some of the limitations in the design. The present study included three parent-child dyads. Performance feedback alone resulted in generalization for one of the participants, the self-monitoring

component was needed for the second parent, and the generalization assessment was not completed for the third parent. Thus, the present design demonstrated a functional relation between the performance feedback and parent acquisition during the training routine, but did not demonstrate a functional relation between either type of parent training and implementation fidelity in the generalization routine. Future research should continue to conduct component analyses and further investigate the importance of individual components of parent training. The present study did not address the question of why some parents may require additional training components while others do not. Future research should assess parent variables, child variables, and generalization variables (i.e. types of generalization) that are associated with the need for additional training components. Furthermore, future research should continue to identify feasible methods of training parents, especially methods that require less one-to-one interaction between specialists and parents and methods that embed the training into pre-existing service delivery models.

The present study indicates written and verbal instructions with performance feedback results in accurate implementation in the trained routine. Additional training components, such as self-monitoring, may be necessary to promote generalization of accurate implementation for some parents. These findings emphasize the importance of evaluating the accuracy of parent implementation in both trained and untrained situations. In practice, it is important that parents are able to implement the intervention accurately across a variety of settings and situations that may contain stimuli not included in the parent training. Therefore, clinicians should monitor the impact of parent training on parents' implementation in both trained and untrained situations. Research should continue to identify and evaluate training

components, such as self-monitoring, which may promote accurate implementation in novel situations.

CHAPTER IV

GENERAL DISCUSSION AND CONCLUSIONS

The purpose of this dissertation was to synthesize the current research in parent-implemented FCT, evaluate the efficacy of a parent-training package, and identify directions for future research. To accomplish this purpose, the present dissertation included a systematic review of the literature and a single-case research study. The systematic review of the parent-implemented FCT literature included a descriptive synthesis, quality evaluation, and social validity assessment. The systematic review of the literature indicated there is a growing body of high-quality literature that suggests parent-implemented FCT reduces challenging behavior in young children with developmental disabilities. Based on the social validity analysis, parent-implemented FCT is acceptable, feasible, and results in meaningful reductions in challenging behavior in applied settings. In the single-case research study, the behavior consultant taught three parents to implement FCT. Performance feedback resulted in accurate implementation in the training routine for all three parents and generalization to a novel routine for one parent. For another parent, the added self-monitoring component resulted in generalization to the novel routine. Together, these two studies suggest training parents to implement FCT results in accurate parent implementation and decreases in child challenging behavior.

Although there are a number of strengths evident in the parent-implemented FCT research, there are also a number of directions for future research. Future research should assess parent-implemented FCT with populations that were underrepresented in the present review. There is a need for research focused on variables that directly affect parent acquisition, generalization, and maintenance. This line of research should evaluate the

feasibility and efficacy of different training packages in addition to further assessing the possible mechanisms for change in parent behavior.

There is a growing body of high-quality studies supporting the use of parent-implemented FCT for young children with developmental disabilities. In order to produce meaningful reductions in challenging behavior, practitioners should consider training parents to implement FCT in home and community settings. Practitioners should monitor the accuracy of implementation during independently conducted sessions and in novel situations to evaluate the efficacy of parent training. Although there is a need for more research in the area, the present dissertation suggests practitioners and researchers who work with children with developmental disabilities should consider the use of parent training in FCT to reduce challenging behavior.

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APPENDIX A

TABLES

Table 1
Researcher-Adapted Definitions of Quality Indicators Based on Kratochwill et al. (2013) and What Works Clearinghouse™ (2014)

Quality Indicator	Meets Standard	Meets with Reservations	Does not Meet
Reliability Standards			
Inter-observer agreement	IOA was collected across 20% of sessions. The average IOA was greater than 0.80 (or 0.60 for Kappa).	Not applicable	Does not meet the criterion
Design Standards			
Multiple-baseline Design	Design includes (a) six or more phases and (b) five or more data points per phase	Design includes (a) six or more phases and (b) three to four data points per phase	Does not meet either criterion
Multiple-probe Design	Meets multiple-baseline design criteria and (a) first three baseline data points overlap, (b) each leg includes three consecutive data points immediately prior to intervention, and (c) with each implementation of intervention, every other leg of the multiple baseline has at least one data point	Meets multiple-baseline design criteria or meets with reservations and (a) at least one probe data point was collected for each leg within the first three baseline data points, (b) each leg includes at least one data point immediately prior to intervention, and (c) with each implementation of intervention, every other leg of the multiple baseline has at least one data point	Does not meet either criterion
Reversal/Withdrawal Design	Design includes (a) four phases and (b) five or more data points per phase	Design includes (a) four phases and (b) three to four data points per phase	Does not meet either criterion
Alternating Treatments Design	Design includes at least five data points per condition with two or fewer data points per phase	Design includes at least four data points per condition with two or fewer data points per phase	Does not meet either criterion

Note. "Leg" indicates individual AB contrasts in a multiple-probe or multiple-baseline design.

Table 2

Researcher-Adapted Definitions of Quality Indicators Based on Reichow et al. (2008)

Quality Indicator	Meets Standard	Meets with reservations	Does not Meet
Primary Indicators			
Participant Characteristics	Described (a) child participant age, (b) child participant gender, (c) child participant diagnosis or reason for eligibility, (d) who implemented the intervention and the individual who trained the interventionist and (d) information about the test for any test scores provided.	Meets all of the criteria except criterion D	Does not meet either criterion
Baseline Condition	Replicable description of baseline	A few details are missing from the description	Does not meet either criterion
Parent Training	Replicable description of parent training.	A few details are missing from the description	Does not meet either criterion
Independent Variable	Replicable description of the independent variable. Manualized interventions meet this criteria	A few details are missing from the description	Does not meet either criterion
Dependent Variable	(a) Operational definition, (b) replicable description of data collection, (c) measurement appropriate for dependent variable, and (d) data collection is appropriate for single-case analysis	Meets 3 of the 4 criteria	Does not meet either criterion
Secondary Indicators			
Blind Raters	Raters are not aware of the treatment condition	Not applicable	Does not meet criterion
Fidelity	Evaluated for all participants, conditions, and implementers. Study presents results of fidelity data.	Not applicable	Does not meet criterion
Generalization or Maintenance	Study assessed generalization or maintenance	Not applicable	Does not meet criterion

Table 3

Researcher-Adapted Definitions of Social Validity Quality Indicators Based on Horner et al. (2005) and Reichow et al. (2008)

Quality Indicator	Operational Definition for Meeting the Criteria
Context	Child would be in the setting in the absence of research
Resources	The intervention did not require atypical materials or time. • Atypical materials were defined as electronic items (unless described as already in the setting prior to the study) and toys or items that required particular features not required in typical toys. • Atypical time was defined as (a) any time required from an intervention agent who does not typically interact with families or (b) the time required from an intervention agent who typically interacts with families exceeds the time allotted in typical service delivery models.
Dependent Variable	
Socially significant dependent variable	(a) The study described the negative impact of the challenging behavior on the child, family, or society or (b) the reader rated the challenging behavior as a behavior that was likely to negatively impact the child, family, or society
Compared to typically developing peers	The study compared the behavior of child participants to typically developing peers before, during, or after the intervention.
Clinically significant challenging behavior reduction	(a) The study indicated the challenging behavior reached a socially important reduction or a clinical cut off or (b) the reader rated the reduction as clinically significant based on the topography of the behavior and the level change indicated in the results.
Interventionist	
Typical implementer	Interventionist typically interacts with the participant (all included studies met this criterion)
Adequate treatment fidelity	Study indicates parent implemented the intervention at or above 80% fidelity on average
Treatment fidelity over time	Study indicates parent can implement the intervention over time without support or coaching from a specialist
Consumer Report	
Satisfaction	Parent reports indicate satisfaction with the intervention or the acceptability of the intervention, defined as rating above neutral
Feasibility	Parent reports indicate the intervention is feasible given typical time and resource restraints, defined as rating above neutral
Efficacy	Parent reports indicate the intervention is effective, defined as rating above neutral
Choose to implement	Parent reports indicate the parent is willing to implement the intervention without support from professionals, defined as rating above neutral

Table 4
Participants and Setting

	Child Participants				Parent Participants		
Citation	Number	Gender	Age	Diagnosis	Number	Relationship to Child	Setting
Arndorfer et al. (1994)	5	Male (4); female (1)	Toddler (1); preschool (3); secondary (1)	Specific delay (1); Down syndrome (1); ASD (1); fetal alcohol syndrome (1); and bipolar disorder (1)	5	Mother	Home
Berg et al. (2007)	4	Male	Preschool	DD	5	Mother (3); mother and father (1)	Home and school (2); home, school, and grandmother's house (1); home and clinic (1)
Brown (1998) and Brown et al. (2000)	2	Male (1); female (1)	Preschool (1); elementary (1)	ID (1); ASD (1)	3	Mother (1); mother and father (1)	Outpatient clinic and home (1); home (1)
Campbell and Lutzker (1993)	1	Male	Elementary	ASD	1	Mother	Home, school, and community settings
Carr et al. (1999)	1	Male	Secondary	ID	1	Mother	Home and community settings
Davis (2008)	1	Male	Elementary	ASD	1	Grandmother	School and grandmother's home
Derby (1994) and Derby et al. (1997)	6	Male (5); female (1)	Toddler (4); preschool (2)	DD (4); ID (1); TD (1)	6	Parent	Home (5); home, school, and summer home (1)

Table 4 Continued

	Child Participants				Parent Participants		
Citation	Number	Gender	Age	Diagnosis	Number	Relationship to Child	Setting
Dunlap et al. (2006)	2	Female	Toddler	Specific delay	2	Mother	Home
Falcomata (2008) and Falcomata et al. (2013)	1	Male	Toddler	DD	1	Mother	Home
Fisher et al. (2013)	1	Male	Secondary	ASD	1	Mother	Clinical
Hanley et al. (2014)	3	Male (2); female (1)	Preschool (1); elementary (1); secondary (1)	ASD	3	Parent	Research clinic and home
Harding, Wacker, Berg, Barretto, and Lee (2005)	2	Male (1); female (1)	Toddler (1); preschool (1)	DD (1); ID (1)	2	Mother	Home
Harding, Wacker, Berg, Barretto, and Ringdahl (2005)	2	Male (1); female (1)	Toddler (1); preschool (1)	CP (1); DD (1)	2	Mother	Home and inpatient unit (1); home (1)
Harding, Wacker, Berg, Lee, et al. (2009)	1	Male	Toddler	DD	1	Mother	Home
Harding, Wacker, Berg, Winborn-Kemmerer, and Lee (2009)	2	Male	Preschool	ID	2	Mother	Home

Table 4 Continued

	Child Participants				Parent Participants		
Citation	Number	Gender	Age	Diagnosis	Number	Relationship to Child	Setting
Harding, Wacker, Berg, Winborn-Kemmerer, Lee, and Ibrahimović (2009)	3	Male	Toddler (2); preschool (1)	Specific delay (1); DD (1); TD (1)	3	Mother	Home
Johnson et al. (2004)	1	Male	Secondary	ASD	1	Mother	Home
Koegel et al. (1998)	3	Male (2); female (1)	Preschool	ASD (2); DD (1)	4	Parents	Home
Lucyshyn et al. (1997)	1	Female	Secondary	ID	2	Mother and father	Home and community
Mancil et al. (2009)	3	Male	Preschool (2); elementary (1)	ASD	3	Mother	Home and school
Moes and Frea (2000)	1	Male	Preschool	ASD	2	Mother and father	Home
Moes and Frea (2002)	3	Male (2); female (1)	Preschool	ASD	6	Mother and father	Home
Moore et al. (2010)	1	Male	Toddler	TBI	1	Mother	Home
Olive et al. (2008)	1	Female	Preschool	ASD	1	Mother	Home
Padilla Dalmau et al. (2011)	2	Male (1); female (1)	Preschool (1); elementary (1)	ASD	2	Mother	Home

Table 4 Continued

	Child Participants				Parent Participants		
Citation	Number	Gender	Age	Diagnosis	Number	Relationship to Child	Setting
Peck (1994) and Peck et al. (1996)	2	Male	Toddler	DD (1); failure to thrive (1)	3	Mother (1); mother and father (1)	Inpatient unit and home
Reeve and Carr (2000)	1	Male	Preschool	Specific delay	1	Mother	Home
Richman et al. (2001)	1	Male	Preschool	ASD	1	Mother	Inpatient unit
Rispoli et al. (2014)	1	Male	Preschool	ASD	1	Mother	Home
Schieltz et al. (2011)	3	Male	Toddler (1); preschool (2)	ASD (2); DD (1)	3	Parent	Home
Schindler and Horner (2005)	3	Male (2); female (1)	Preschool	ASD	3	Parent	Preschool and home
Suess et al. (2014)	3	Male	Toddler (2); preschool (1)	ASD	3	Parent	Home
Tait et al. (2004)	6	Male (3); female (3)	Toddler (5); preschool (1)	CP	6	Mother	Home
Tarbox et al. (2003)	1	Male	Elementary (1)	ASD	1	Mother	Community
Wacker et al. (2008)	3	Male (2); female (1)	Preschool	Fragile X syndrome (1); ASD (1); ODD (1)	3	Mother	Home
Wacker et al. (2011)	2	Male (1); female (1)	Preschool	ASD (1); Fragile X syndrome (1)	2	Mother	Home

Table 4 Continued

	Child Participants				Parent Participants		
Citation	Number	Gender	Age	Diagnosis	Number	Relationship to Child	Setting
Wacker, Harding, et al. (2013)	3	Male (2); female (1)	Toddler (2); preschool (1)	ID (2); DD (1)	3	Mother	Home
Winborn (2003) and Winborn-Kemmerer et al. (2010)	2	Male (1); female (1)	Preschool	Down syndrome (1); DD (1)	2	Mother	Home

Note. DD = developmental disability or developmental delay. ASD = autism spectrum disorder. TD = typically developing. ID = intellectual disability. TBI = traumatic brain injury. CP = cerebral palsy. ODD = oppositional defiant disorder. "Toddler" indicates ages birth to 35 months; "preschool" indicates ages 36 months to 5 years 11 months; "elementary" indicates ages 6 years to 10 years 11 months; "secondary" indicates ages 11 years to 20 years 11 months; "adult" indicates ages 21 years and older. Numbers in parentheses indicate the number of participants in each category.

Table 5
Parent Involvement

	Functional Behavior Assessment				Functional Communication Training			
Citation	Interview	Observation	Functional Analysis	Data Collection	Development	Implement	Outside of Research	Data Collection
Arndorfer et al. (1994)	Y	Y	Y	Y	N	A	N	N
Berg et al. (2007)	Y	Y	Y	Y	N	A	Y	N
Brown (1998) and Brown et al. (2000)	Y	N/A	Y	N	Y	A	N	N
Campbell and Lutzker (1993)	N/A	Y	N/A	Y	Y	S	Y	Y
Carr et al. (1999)	Y	Y	N/A	N	N	S	N	N
Davis (2008)	N/A	N/A	N	N	N	S	N	N
Derby (1994) and Derby et al. (1997)	Y	Y	Y	Y	N	A	Y	N
Dunlap et al. (2006)	Y	Y	N/A	N	N	A	N	N
Falcomata (2008) and Falcomata et al. (2013)	N/A	Y	Y	N	N	A	N	N
Fisher et al. (2013)	N/A	N/A	N	N	N	S	N	N
Hanley et al. (2014)	Y	N	Y	N	N	S	N	N

Table 5 Continued

Citation	Functional Behavior Assessment				Functional Communication Training			
	Interview	Observation	Functional Analysis	Data Collection	Development	Implement	Outside of Research	Data Collection
Harding, Wacker, Berg, Barretto, and Lee (2005)	N/A	N/A	Y	N	N	A	N	N
Harding, Wacker, Berg, Barretto, and Ringdahl (2005)	Y	Y	Y	N	Y	A	Y	N
Harding, Wacker, Berg, Lee, et al. (2009)	Y	Y	Y	Y	N	A	Y	N
Harding, Wacker, Berg, Winborn-Kemmerer, and Lee (2009)	N/A	N/A	Y	N	N	A	Y	N
Harding, Wacker, Berg, Winborn-Kemmerer, Lee, and Ibrahimović (2009)	N/A	N/A	Y	N	N	A	N	N
Johnson et al. (2004)	N/A	N/A	Y	N	N	A	N	N
Koegel et al. (1998)	N/A	Y	N/A	N	Y	A	N	N
Lucyshyn et al. (1997)	Y	Y	Y	N	Y	A	Y	Y
Mancil et al. (2009)	Y	Y	N	N	N	A	N	Y
Moes and Frea (2000)	N/A	N/A	N/A	N/A	Y	A	N	N
Moes and Frea (2002)	Y	N/A	Y	N	N	A	N	N
Moore et al. (2010)	Y	Y	Y	N	N	S	N	N

Table 5 Continued

	Functional Behavior Assessment				Functional Communication Training			
Citation	Interview	Observation	Functional Analysis	Data Collection	Development	Implement	Outside of Research	Data Collection
Olive et al. (2008)	Y	Y	Y	N	N	A	N	N
Padilla Dalmau et al. (2011)	N/A	N/A	Y	N	N	A	Y	N
Peck (1994) and Peck et al. (1996)	Y	N/A	N	N	N	A	N	N
Reeve and Carr (2000)	N/A	N/A	N	N	N	A	N	N
Richman et al. (2001)	N/A	N/A	Y	N	N	A	N	N
Rispoli et al. (2014)	N/A	N/A	Y	N	N	A	N	N
Schieltz et al. (2011)	Y	N/A	Y	N	N	A	N	N
Schindler and Horner (2005)	Y	N/A	N/A	N	Y	S	N	N
Suess et al. (2014)	N/A	N/A	Y	N	N	A	Y	N
Tait et al. (2004)	Y	N/A	N/A	N	N	A	N	N
Tarbox et al. (2003)	Y	N/A	Y	N	N	S	N	N
Wacker et al. (2008)	N/A	N/A	Y	N	N	A	N	N
Wacker et al. (2011)	N/A	N/A	Y	N	N	A	Y	N
Wacker, Harding, et al. (2013)	N/A	N/A	Y	N	N	A	Y	N

Table 5 Continued

Citation	Functional Behavior Assessment				Functional Communication Training			
	Interview	Observation	Functional Analysis	Data Collection	Development	Implement	Outside of Research	Data Collection
Winborn (2003) and Winborn-Kemmerer et al. (2010)	N/A	N/A	Y	N	Y	A	N	N

Note. N/A = not applicable, the procedure was not included in the study. Y = yes, the parent implemented the procedure. N = no, the parent did not implement the procedure. A = the parent implemented all of the sessions. S = the parent implemented some of the sessions.

Table 6
Parent Treatment Fidelity

Citation	TF Data	TF above 80%	Independent Sessions	Length of Implementation	Gen. and Maint.	Parent Trainer TF
Brown (1998) and Brown et al. (2000)	97% (85% of sessions)	Y	N	14 sessions	N	N
Carr et al. (1999)	Final treatment probe 45-70% of communication reinforced (100% of sessions). IOA on response 82-89% (40% of sessions). Line graph included.	Unclear	N	1.5 to 2 years	N	N
Davis (2008)	95% (100% of sessions)	Y	N	6 sessions, 5-min each	N	N
Derby (1994) and Derby et al. (1997)	Communication reinforcement: 84% (100% of sessions). Contingent demands or time-out from reinforcement 48% (100% of sessions)	Y	Y	6-27 months	Maint. 20 to 21 months	N
Dunlap et al. (2006)	Attention following CB 0-33.3% of intervals (100% of sessions). Prompts for FCR 25-100% of sessions (100% of sessions). Reinforcement for FCR 55-100% of sessions (100% of sessions). IOA on TF above 98-100% (100% of sessions).	Unclear	Y	5 to 6 weeks	N	100% (100% of sessions)
Johnson et al. (2004)	Aggregated across inter-observer agreement and implementation fidelity data: 92% (33% of sessions)	Unclear	N	33 sessions, 5-min each	N	N

Table 6 Continued

Citation	TF Data	TF above 80%	Independent Sessions	Length of Implementation	Gen. and Maint.	Parent Trainer TF
Mancil et al. (2009)	Aggregated across teachers and parents: 92.4% (100% of sessions)	Y	Y	3 to 4 weeks	N	N
Olive et al. (2008)	96% (100% of sessions)	Y	Y	31 sessions, 5-min sessions	N	N
Peck (1994) and Peck et al. (1996)	0-100% of intervals with attention during intervention, average unclear (100% of sessions). Line graph included.	Unclear	N	6 months for one participant, unclear for others	6 months maint. (for one of two participants)	N
Rispoli et al. (2014)	Aggregated across thearpists and parents: 99% (30% of sessions). IOA on TF 99% (15% of sessions)	Unclear	N	53 sessions, 5-min each	N	N
Schindler and Horner (2005)	100% (100% of sessions)	Y	N	4 to 9 sessions, 10-min each	N	N
Suess et al. (2014)	74-94% during coached sessions, 72-88% during independent sessions. Last independent phase above 80% for all parents. Line graph included.	Y	Y	2 to 3.5 months	N	N
Tait et al. (2004)	Implementation fidelity increased from baseline to intervention. Percentage of steps implemented correctly unclear. Line graph included.	Unclear	Y	6 to 9 months	3 to 6 months maint.	N
Wacker et al. (2008)	18-92% of intervals with parent attention (100% of sessions). Line graph included.	Unclear	N	3 to 9 days	N	N

Table 6 Continued

Citation	TF Data	TF above 80%	Independent Sessions	Length of Implementation	Gen. and Maint.	Parent Trainer TF
Wacker, Harding, et al. (2013)	99% (31% of sessions)	Y	N	6 to 9 months	N	N
Winborn (2003) and Winborn-Kemmerer et al. (2010)	99% (30% of sessions). IOA on TF 100% (30% of sessions).	Y	N	2 to 4 months	N	N

Note. TF = treatment fidelity. Gen. = generalization. Maint. = maintenance. IOA = inter-observer agreement. Y = yes. N = no.

Table 7
Quality Indicators

	Primary Indicators (Reichow et al., 2008)					Secondary Indicators (Reichow et al., 2008)			Evidence Evaluation (Kratochwill et al., 2013)		
Citation	Part. Info.	BL	TR	INT	DV	Blind Raters	TF	Gen. and Maint.	Reli.	Design	Strength of Evidence
Arndorfer et al. (1994)	Y	R	N	R	Y	N	N	N	Y	N	
Berg et al. (2007)	Y	Y	R	Y	R	N	N	Y	Y	N	
Brown (1998) and Brown et al. (2000)	Y	R	N	R	R	N	Y	N	Y	N	
Campbell and Lutzker (1993)	Y	R	R	R	Y	N	N	Y	Y	N	
Carr et al. (1999)	R	Y	Y	Y	Y	N	Y	Y	Y	N	
Davis (2008)	R	Y	N	Y	Y	N	Y	Y	Y	N	
Derby (1994) and Derby et al. (1997)	Y	R	N	R	R	N	Y	Y	Y	N	
Dunlap et al. (2006)	Y	Y	Y	R	Y	Y	Y	Y	Y	R	No evidence
Falcomata (2008) and Falcomata et al. (2013)	R	Y	N	Y	Y	N	N	Y	Y	Y	No evidence
Fisher et al. (2013)	Y	R	N	R	Y	N	N	Y	Y	Y	No evidence
Hanley et al. (2014)	Y	Y	N	R	R	N	N	N	Y	R	Strong evidence
Harding, Wacker, Berg, Barretto, and Lee (2005)	Y	R	N	Y	R	N	N	Y	Y	N	

Table 7 Continued

	Primary Indicators (Reichow et al., 2008)					Secondary Indicators (Reichow et al., 2008)			Evidence Evaluation (Kratochwill et al., 2013)		
Citation	Part. Info.	BL	TR	INT	DV	Blind Raters	TF	Gen. and Maint.	Reli.	Design	Strength of Evidence
Harding, Wacker, Berg, Barretto, and Ringdahl (2005)	Y	Y	N	Y	Y	N	N	N	Y	N	
Harding, Wacker, Berg, Lee, et al. (2009)	Y	Y	R	R	Y	N	N	Y	Y	R	Strong evidence
Harding, Wacker, Berg, Winborn-Kemmerer, and Lee (2009)	Y	R	Y	Y	Y	N	N	N	Y	N	
Harding, Wacker, Berg, Winborn-Kemmerer, Lee, and Ibrahimović (2009)	Y	Y	Y	Y	R	N	N	N	Y	N	
Johnson et al. (2004)	R	Y	N	Y	R	N	Y	N	Y	N	
Koegel et al. (1998)	Y	Y	Y	R	Y	Y	N	Y	Y	Y	No evidence
Lucyshyn et al. (1997)	Y	Y	R	N	Y	N	N	Y	N	Y	
Mancil et al. (2009)	Y	Y	Y	Y	R	Y	Y	Y	Y	Y	Strong evidence
Moes and Frea (2000)	Y	N	R	Y	R	N	N	Y	Y	N	
Moes and Frea (2002)	Y	R	Y	R	Y	Y	N	Y	N	N	
Moore et al. (2010)	Y	Y	N	Y	Y	N	N	N	Y	N	

Table 7 Continued

	Primary Indicators (Reichow et al., 2008)					Secondary Indicators (Reichow et al., 2008)			Evidence Evaluation (Kratochwill et al., 2013)		
Citation	Part. Info.	BL	TR	INT	DV	Blind Raters	TF	Gen. and Maint.	Reli.	Design	Strength of Evidence
Olive et al. (2008)	Y	Y	Y	R	Y	N	Y	N	Y	R	Strong evidence
Padilla Dalmau et al. (2011)	Y	Y	R	Y	R	N	N	N	Y	R	Strong evidence (1); no evidence (1)
Peck (1994) and Peck et al. (1996)	Y	N/A	N	Y	Y	N	Y	Y	Y	N	
Reeve and Carr (2000)	Y	Y	Y	Y	Y	Y	N	N	Y	N	
Richman et al. (2001)	Y	Y	N	Y	Y	N	N	N	Y	N	
Rispoli et al. (2014)	Y	Y	N	R	Y	N	Y	Y	Y	N	
Schieltz et al. (2011)	Y	Y	N	Y	Y	N	N	Y	Y	R	No evidence
Schindler and Horner (2005)	Y	Y	N	R	Y	N	Y	Y	Y	Y	Strong evidence (1); no evidence (2)
Suess et al. (2014)	Y	N/A	Y	R	Y	N	Y	N	Y	N	
Tait et al. (2004)	Y	Y	Y	R	Y	N	Y	Y	Y	R	Strong evidence (1); no evidence (5)
Tarbox et al. (2003)	R	N	N	N	Y	N	N	N	Y	N	
Wacker et al. (2008)	Y	Y	N	Y	R	N	Y	N	Y	N	
Wacker et al. (2011)	Y	Y	R	Y	Y	N	N	Y	Y	R	Strong evidence (1); no evidence (1)

Table 7 Continued

Citation	Primary Indicators (Reichow et al., 2008)					Secondary Indicators (Reichow et al., 2008)			Evidence Evaluation (Kratochwill et al., 2013)		
	Part. Info.	BL	TR	INT	DV	Blind Raters	TF	Gen. and Maint.	Reli.	Design	Strength of Evidence
Wacker, Harding, et al. (2013)	Y	Y	R	Y	Y	N	Y	N	Y	R	Strong evidence (2) No evidence (1)
Winborn (2003) and Winborn-Kemmerer et al. (2010)	R	Y	N	Y	R	N	Y	N	Y	N	

Note. Part. Info. = participant information. BL = baseline. TR = parent training. INT = intervention. DV = dependent variable. TF = treatment fidelity. Gen. and Maint. = generalization and maintenance. Reli. = reliability. "Y" indicates the study met the indicator. "R" indicates the study met the indicator with reservations. "N" indicates the study did not meet the indicator. N/A = not applicable and indicates the study did not include procedures relevant to the indicator. Numbers in parentheses indicate the number of participants in each category.

Table 8
Social Validity Assessment

				Dependent Variable			Treatment Fidelity			
Citation	Context	Resource	Typical Implementer	Comp. to TD	Social Sig.	Reduct.	Adequate	Over Time	Consumer Report	Total
Arndorfer et al. (1994)	Y	N	Y	N	Y	Y	N	N	N	4/12
Berg et al. (2007)	Y	N	Y	N	Y	Y	N	N	N	4/12
Brown (1998) and Brown et al. (2000)	Y	N	Y	N	Y	N	Y	N	N	4/12
Campbell and Lutzker (1993)	Y	N	Y	N	Y	Y	N	N	N	4/12
Carr et al. (1999)	Y	N	Y	Y	Y	Y	N	N	N	5/12
Davis (2008)	Y	N	Y	N	Y	Y	Y	N	N	5/12
Derby (1994) and Derby et al. (1997)	Y	N	Y	N	Y	Y	N	N	N	4/12
Dunlap et al. (2006)	Y	Y	Y	Y	Y	Y	N	N	4/4	10/12
Falcomata (2008) and Falcomata et al. (2013)	N	N	Y	N	Y	Y	N	N	N	3/12
Fisher et al. (2013)	Y	N	Y	N	Y	Y	N	N	N	4/12
Hanley et al. (2014)	Y	Y	Y	Y	Y	Y	N	N	3/4	9/12
Harding, Wacker, Berg, Barretto, and Lee (2005)	Y	N	Y	Y	Y	Y	N	N	1/4	6/12

Table 8 Continued

Citation	Context	Resource	Typical Implementer	Dependent Variable			Treatment Fidelity		Consumer Report	Total
				Comp. to TD	Social Sig.	Reduct.	Adequate	Over Time		
Harding, Wacker, Berg, Barretto, and Ringdahl (2005)	Y	N	Y	N	Y	Y	N	N	1/4	5/12
Harding, Wacker, Berg, Lee, et al. (2009)	Y	N	Y	N	Y	Y	N	N	2/4	6/12
Harding, Wacker, Berg, Winborn-Kemmerer, and Lee (2009)	Y	N	Y	N	Y	Y	N	N	N	4/12
Harding, Wacker, Berg, Winborn-Kemmerer, Lee, and Ibrahimović (2009)	Y	N	Y	N	Y	Y	N	N	1/4	5/12
Johnson et al. (2004)	Y	N	Y	N	Y	Y	N	N	N	4/12
Koegel et al. (1998)	Y	N	Y	N	Y	Y	N	N	N	4/12
Lucyshyn et al. (1997)	Y	N	Y	N	Y	Y	N	N	4/4	8/12
Mancil et al. (2009)	Y	N	Y	N	Y	Y	Y	Y	2/4	8/12
Moes and Frea (2000)	Y	N	Y	N	Y	N	N	N	2/4	5/12
Moes and Frea (2002)	Y	N	Y	Y	Y	N	N	N	2/4	7/12
Moore et al. (2010)	Y	N	Y	N	Y	Y	N	N	2/4	6/12

Table 8 Continued

Citation	Context	Resource	Typical Implementer	Dependent Variable			Treatment Fidelity		Consumer Report	Total
				Comp. to TD	Social Sig.	Reduct.	Adequate	Over Time		
Olive et al. (2008)	Y	N	Y	N	Y	Y	Y	N	2/4	7/12
Padilla Dalmau et al. (2011)	Y	N	Y	N	Y	Y	N	N	N	4/12
Peck (1994) and Peck et al. (1996)	Y	N	Y	N	Y	Y	N	N	2/4	6/12
Reeve and Carr (2000)	Y	N	Y	Y	Y	N	N	N	N	4/12
Richman et al. (2001)	N	N	Y	N	Y	Y	N	N	N	3/12
Rispoli et al. (2014)	Y	N	Y	N	Y	Y	N	N	N	4/12
Schieltz et al. (2011)	Y	N	Y	N	Y	Y	N	N	N	4/12
Schindler and Horner (2005)	Y	N	Y	Y	Y	Y	Y	N	1/4	7/12
Suess et al. (2014)	Y	N	Y	Y	Y	N	Y	Y(2); N(1)	1/4	7/12
Tait et al. (2004)	Y	N	Y	N	Y	N	N	N	N	3/12
Tarbox et al. (2003)	Y	N	Y	N	Y	Y	N	N	N	4/12
Wacker et al. (2008)	Y	N	Y	N	Y	N	N	N	N	3/12
Wacker et al. (2011)	Y	N	Y	N	Y	Y	N	N	2/4	6/12
Wacker, Harding, et al. (2013)	Y	N	Y	N	Y	Y	Y	N	N	5/12

Table 8 Continued

Citation	Context	Resource	Typical Implementer	Dependent Variable			Treatment Fidelity		Consumer Report	Total
				Comp. to TD	Social Sig.	Reduct.	Adequate	Over Time		
Winborn (2003) and Winborn-Kemmerer et al. (2010)	Y	N	Y	N	Y	Y	Y	N	N	5/12

Note. Resource = typical resources. Compared to TD = compared the participant's behavior to typically developing peers. Social sig. = socially significant dependent variable. Reduct. = clinically significant challenging behavior reduction. Adequate = adequate treatment fidelity. Over Time = treatment fidelity over time. "Y" indicates the study met the standard. "N" indicates the study did not meet the standard. Numbers in parentheses indicate the number of participants in each category.

Table 9
Inter-Observer Agreement and Behavior Consultant Implementation Fidelity

	Percentage of Sessions	Parent IF IOA	Child CB IOA	Child Comm. IOA	Behavior Consultant IF
TBFA					
Michael	37%	N/A	91% (75%-100%)	N/A	100%
Luis	40%	N/A	100%	N/A	100%
Lucas	43%	N/A	100%	N/A	100%
Baseline					
Michael	38%	91% (88%-92%)	100%	100%	100%
Luis	38%	100%	100%	100%	100%
Lucas	44%	95% (88%-100%)	88% (75%-100%)	88% (75%-100%)	100%
Performance Feedback					
Michael	44%	88% (67%-100%)	94% (75%-100%)	100%	100%
Luis	44%	83% (78%-90%)	81% (50%-100%)	100%	100%
Lucas	33%	91% (88%-100%)	94% (75%-100%)	100%	99% (97%-100%)
Self-Monitoring					
Luis	40%	93% (67%-100%)	91% (75%-100%)	94% (75%-100%)	100%

Note. IOA = inter-observer agreement. IF = implementation fidelity. CB = challenging behavior. Comm. = communication. TBFA = trial-based functional analysis. N/A = not applicable. Numbers in parentheses indicate the range by condition for the TBFA or the range by session for the remaining phases.

Table 10
Effect Sizes

	Parent Implementation Fidelity			Challenging Behavior			Communication		
	Tau	95% CI lower, upper	*p*	Tau	95% CI lower, upper	*p*	Tau	95% CI lower, upper	*p*
Michael									
Training BL-PF	0.86	0.17, 1.55	0.02	0.80	0.11, 1.49	0.02	1.00	0.31, 1.69	0.01
Luis									
Training BL-PF	1.00	0.28, 1.72	0.01	0.67	-0.05, 1.38	0.07	1.00	0.28, 1.72	0.01
Gen BL-PF	1.00	0.00, 2.00	0.05	0.11*	-0.89, 1.11*	0.83*	1.00	0.00, 2.00	0.05
Training PF-SM	0.31*	-0.30, 0.93*	0.32*	-0.02*	-0.63, 0.60*	0.95*	0.28*	-0.34, 0.89*	0.38*
Gen PF-SM	0.82	0.07, 1.57	0.03	0.69	-0.05, 1.44	0.07	0.49*	-0.26, 1.23*	0.20*
Lucas									
Training BL-PF	1.00	0.35, 1.65	<0.01	0.60	-0.06, 1.25	0.07	1.00	0.35, 1.65	<0.01
Gen BL-PF	1.00	0.12, 1.88	0.03	0.87*	-0.01, 1.74*	0.05*	0.93	0.57, 1.81	0.04

Note. CI = confidence interval. BL-PF = baseline to performance feedback comparison. PF-SM = performance feedback to self-monitoring comparison. Gen = generalization.
*Indicates positive trend in baseline was corrected (i.e., TauU was used; Parker & Vannest, 2012).

APPENDIX B

FIGURES

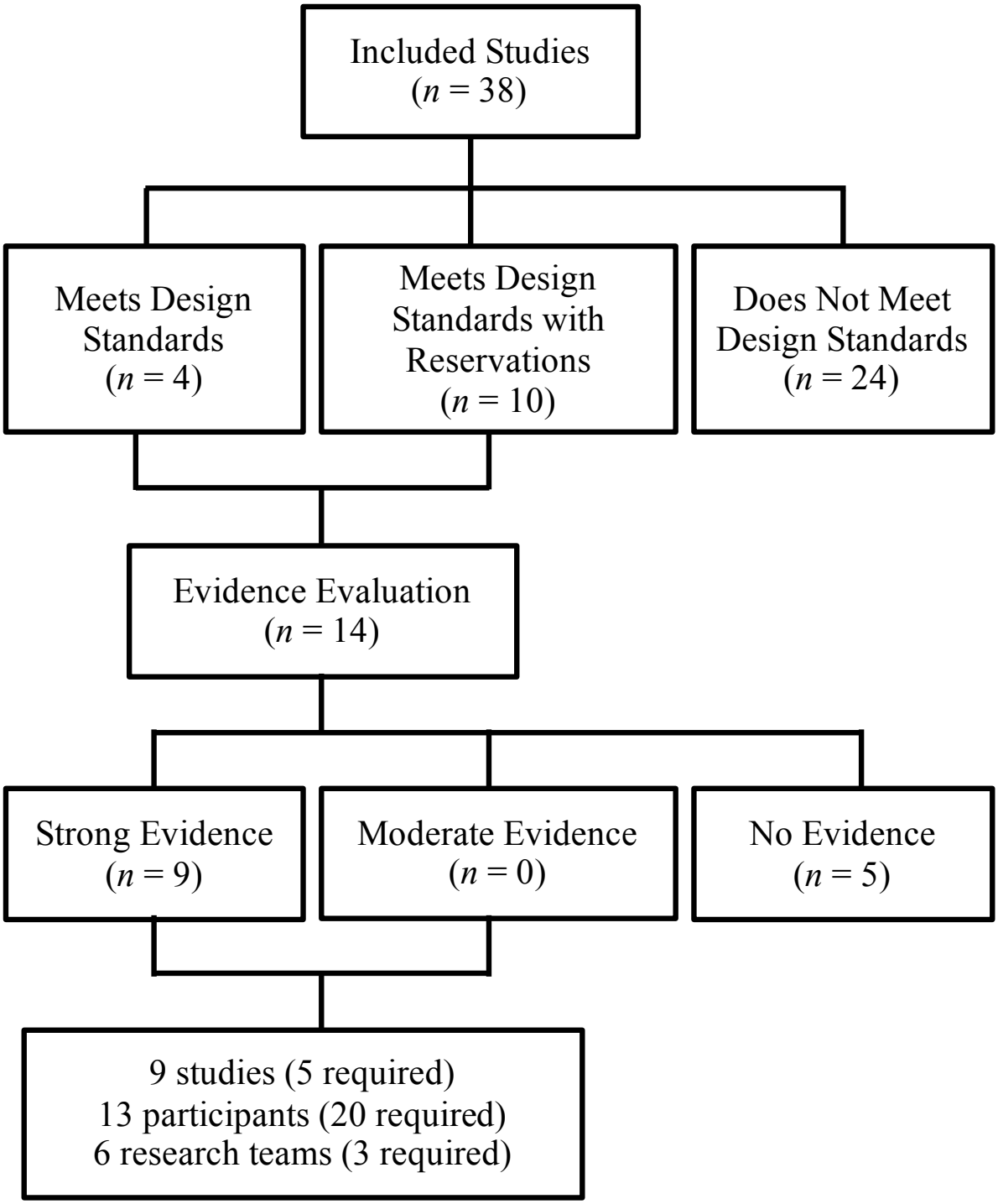

Figure 1. Evidence evaluation based on Kratochwill et al. (2013).

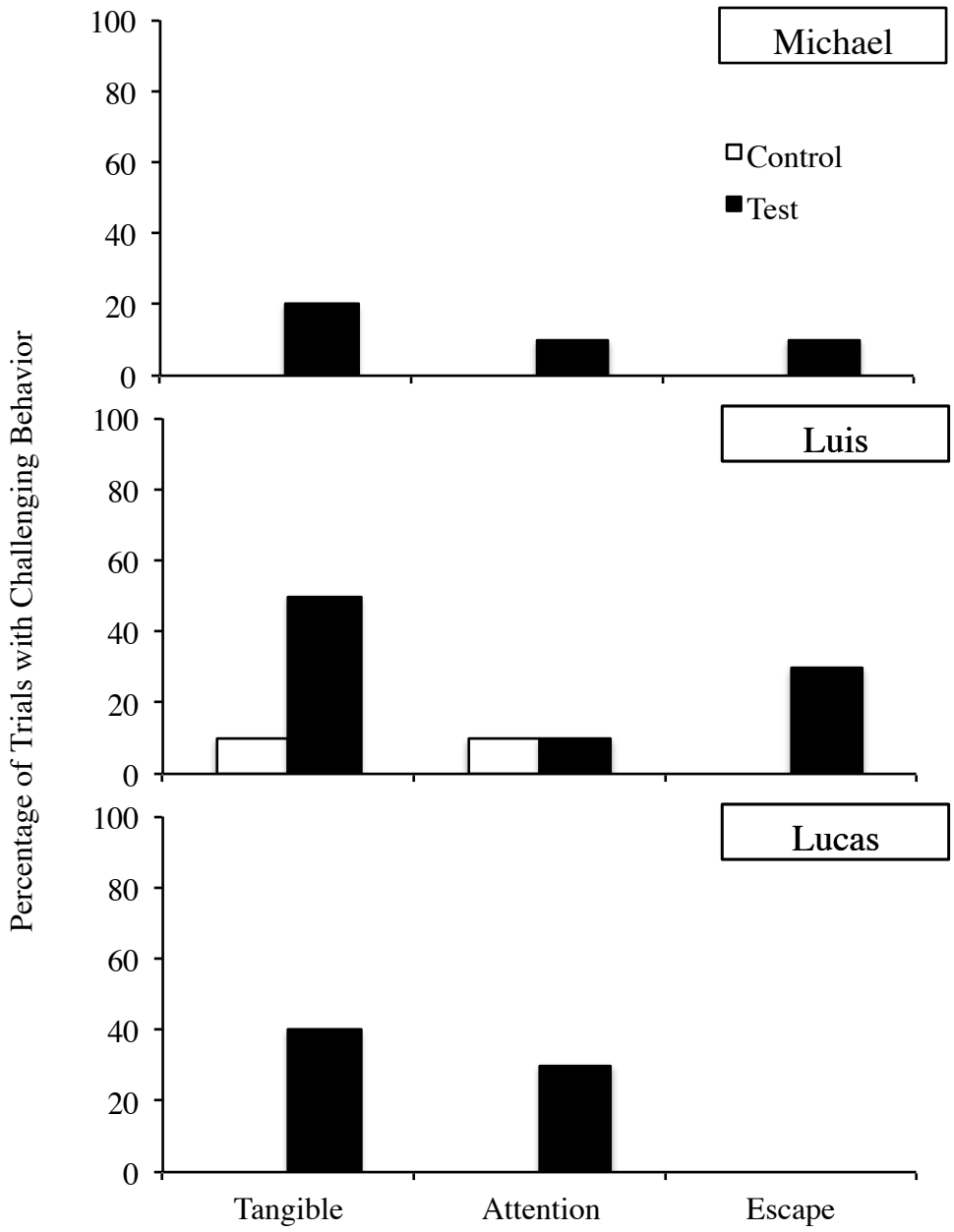

Figure 2. Percentage of trials with challenging behavior during the control and test portions of the tangible, attention, and escape conditions.

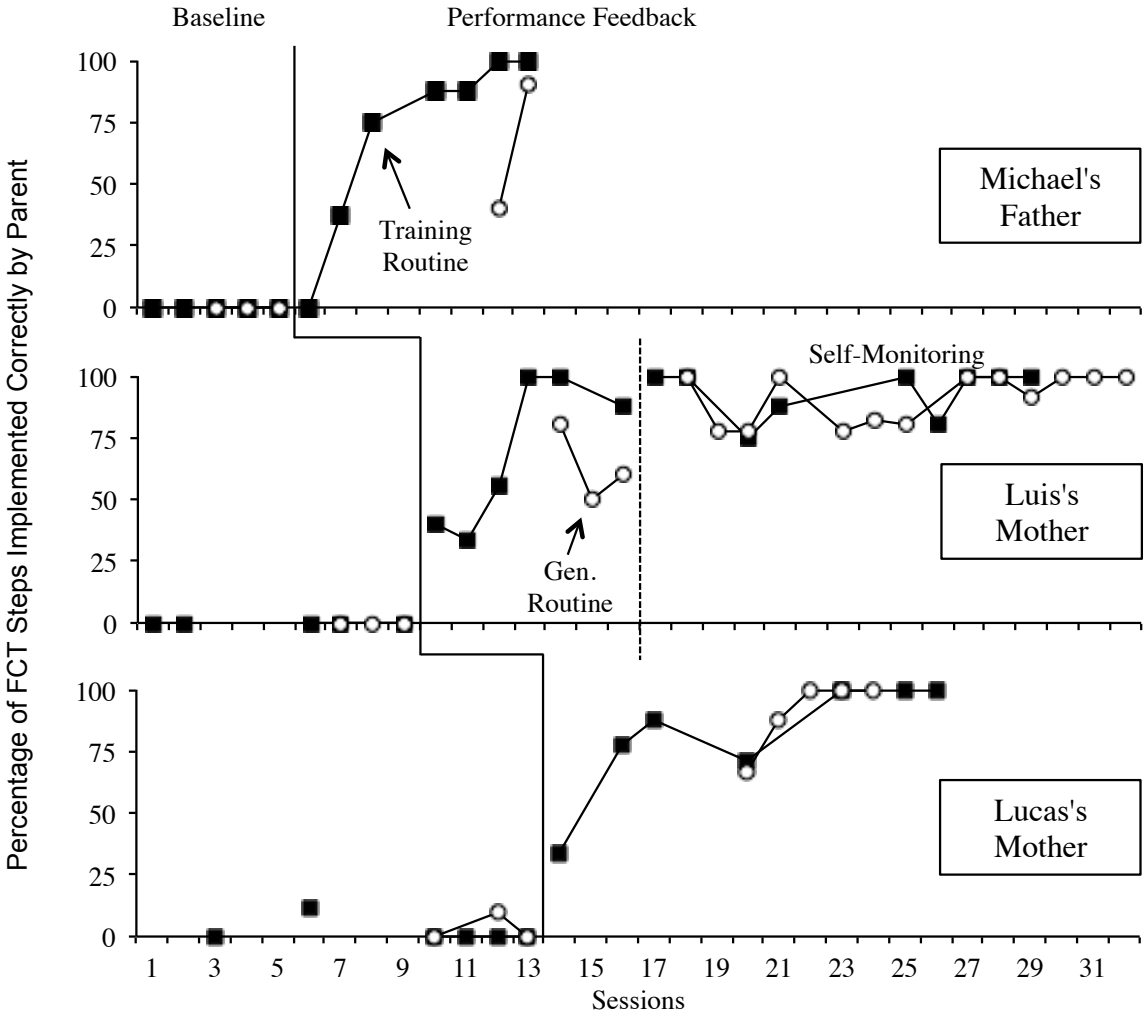

Figure 3. Percentage of steps implemented correctly by the parent during the baseline, performance feedback, and self-monitoring phases. "Gen." = generalization.

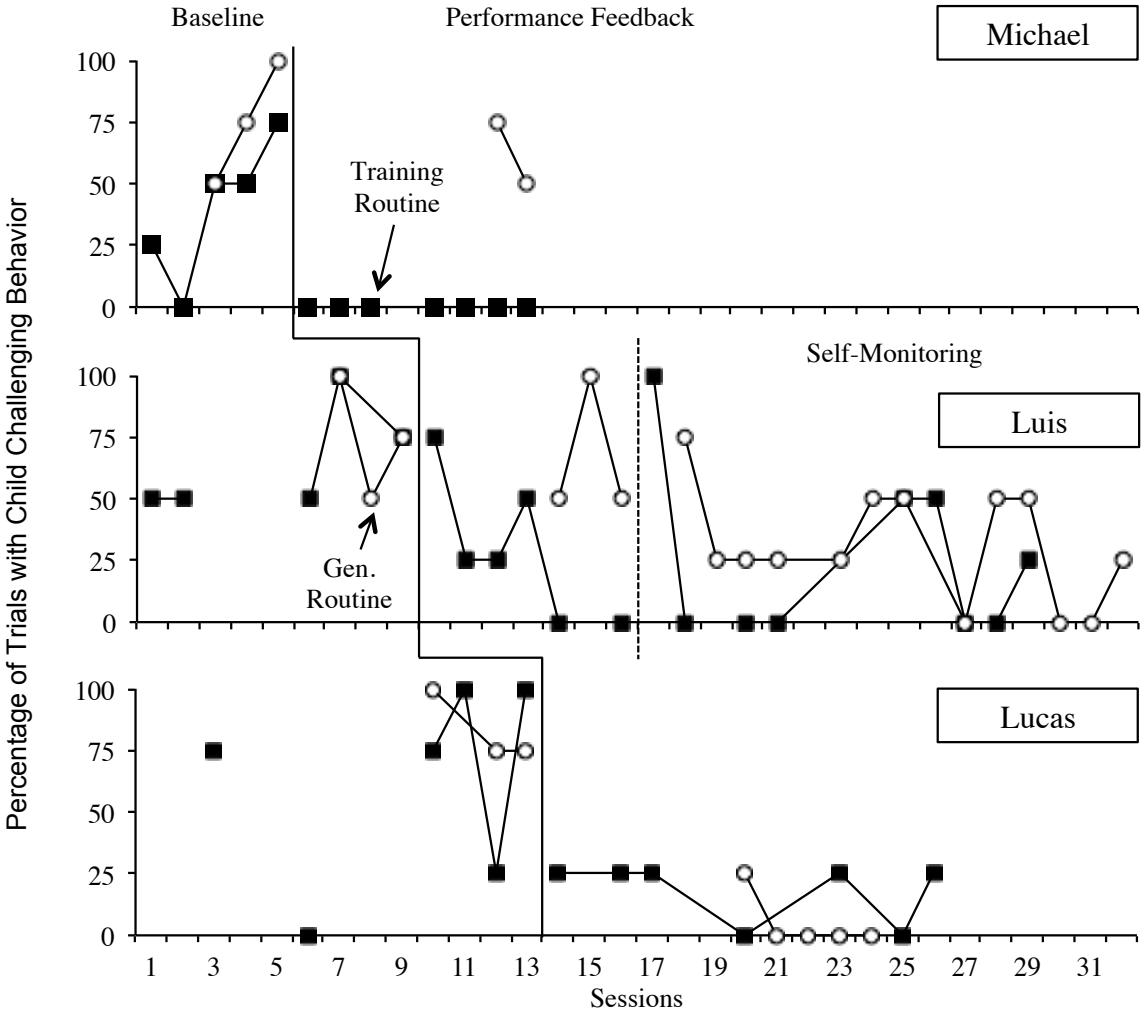

Figure 4. Percentage of trials with challenging behavior during baseline, performance feedback, and self-monitoring phases. "Gen." = generalization.

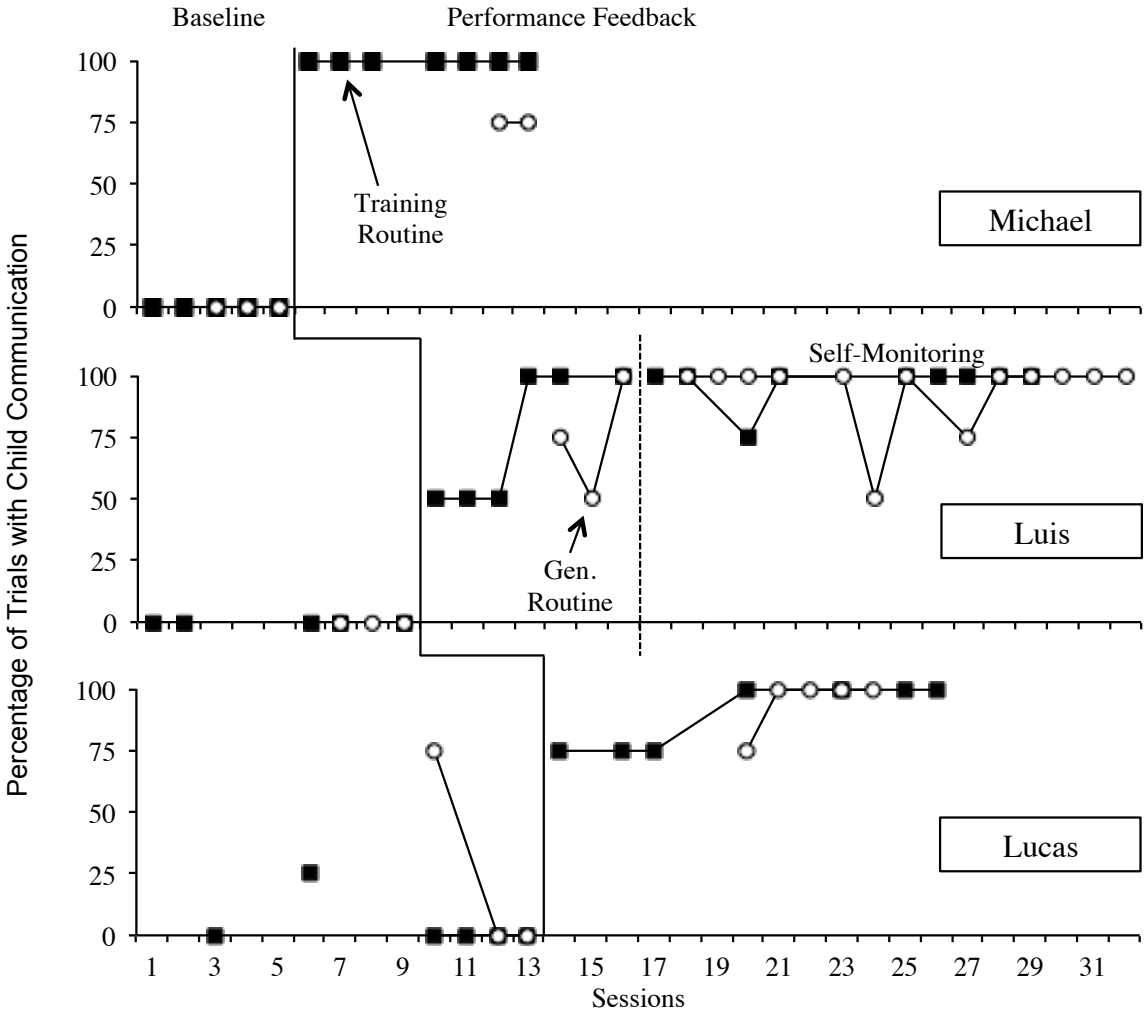

Figure 5. Percentage of trials with communication during baseline, performance feedback, and self-monitoring phases. "Gen." = generalization.